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WIRE MEN

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JUNE 18, 1930

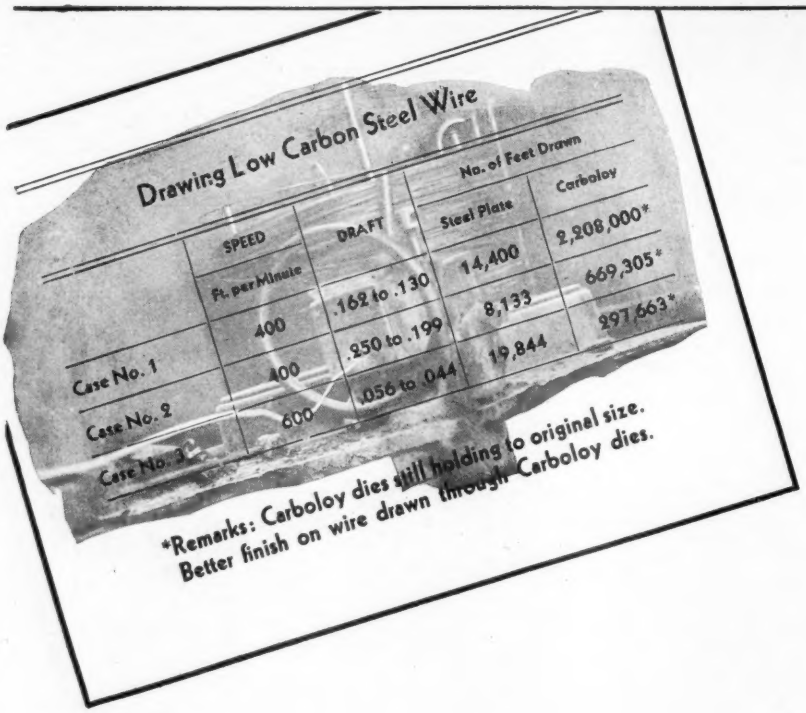
IT IS **WIRE DAY** AT THE

Iron and Steel Exposition at Buffalo

Details of show week program on page 151

CARBOLOY Service

to the Wire Drawing Industry . . .



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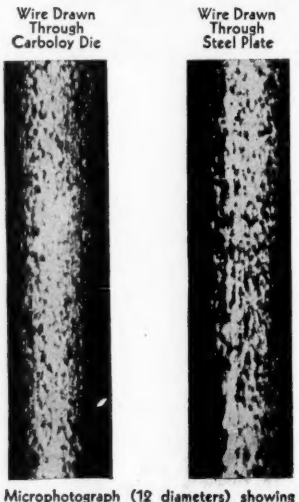

Microphotograph (12 diameters) showing better finish on wire drawn through Carboloy Die at large New Jersey mill. See page 10, Vol. II., No. 2, CARBOLOY.

WIRE & WIRE PRODUCTS, Vol. 5, No. 5, May, 1930. Executive office, 551 Fifth Avenue, New York, N. Y. Published by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secretary and Treasurer. Publication office, 49 E. Washington Ave., Washington, N. J. Subscription price: U. S. and Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office at Washington, N. J., under the Acts of March, 1879, and copyright, 1929, by Quinn-Brown Publishing Corporation.

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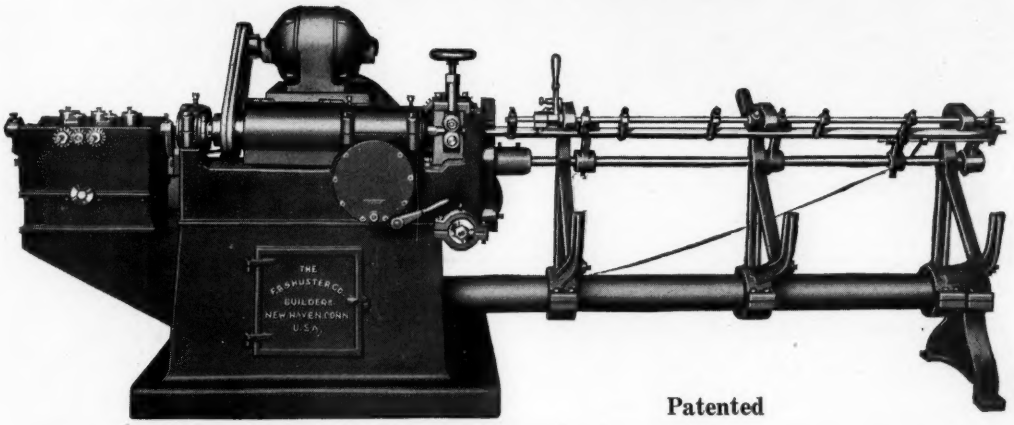

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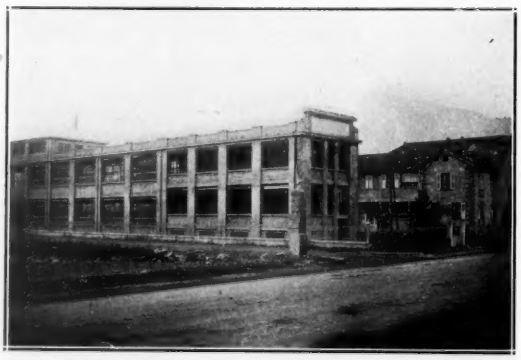

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Balloffet Diamond Wire Dies Co., Inc.

13-15 East 22nd St., New York City

PLANTS AT

New York Lagnieu (France) Cluses (France) Trevoux (France)

WHY BALLOFFET

is the leader in the Diamond Dies Industry

EXPERIENCE

The **Societe des Filieres Balloffet** in France have been engaged in the manufacture of dies since 1870. The American Branch, the **Balloffet Diamond Wire Dies** Co. Inc. has been established in this country for more than 25 years.

These few words suffice to demonstrate the experience of **Balloffet** and their specialized knowledge of American requirements.

HIGHEST QUALITY STONES

Because of the broad experience acquired in these sixty years, **Balloffet's** experts are particularly qualified to select the best stones available for the manufacture of reliable dies. The diamond is a natural formation of exceptionally complex and variable character, and long experience is the only sure guide in the selection of proper stones.

The **Societe des Filieres Balloffet** rank among the foremost buyers in the market and their heavy requirements insure the widest choice of appropriate stock and the most favorable terms of purchase. These advantages pass on in turn to the benefit of **Balloffet** customers.

STEEL SETTINGS

Ever since their introduction in America, **Balloffet Diamond Dies** have been mounted in a special steel setting, which, patented 25 years ago has proved its worth over that period of time. All experts agree that this setting strengthens the stones and prolongs their life to a considerable extent.

PRODUCTION

In their three French plants in Lagnieu, Trevoux and Cluses, the **Societe des Filieres Balloffet** employ more than 200 specialists in die manufacture, and yearly convert more than 50.000 carats of rough diamonds into finished dies.

Balloffet therefore are not mere resellers obtaining supplies from many sources and their production carried on under a single and long established system of supervision, results in an unrivalled and perfect uniformity of quality.

WHY BALLOFFET

is in position to serve customers promptly and efficiently

STOCK IN AMERICA

Besides the quantities of dies that the French main works hold ready for immediate shipment on cabled notice, the **Balloffet Diamond Wire Dies Co.,** will now constantly maintain in America a very large stock of more than 8,000 dies, from .001″ up to .082″ in every diameter in use on the American Market. This stock will enable the **Balloffet Diamond Wire Dies Co.** to take instant and proper care of all requirements.

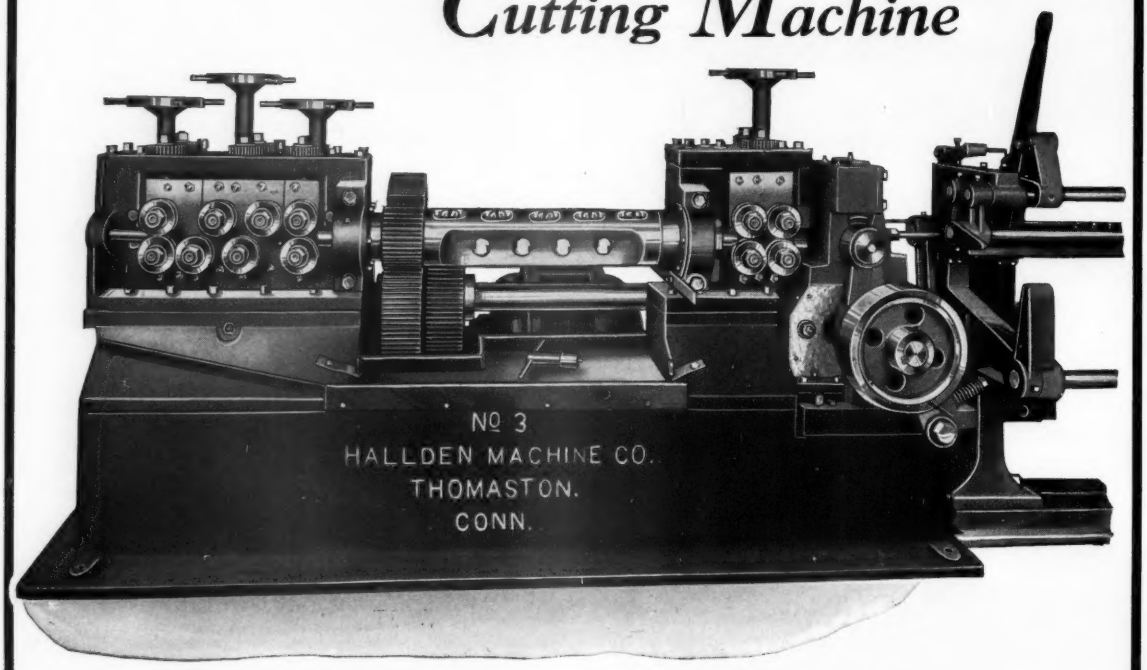
RECUTTING WORK

Expert workmen in the New York factory of the **Balloffet Diamond Wire Dies Co.** are in a position to handle all recutting works promptly and efficiently.

The aim of the **Balloffet Diamond Wire Dies Co.** lately wholly reorganized in America and now under a new and reliable management is to give customers service that will be something more than adequate; service that will be prompt and efficient and that customers are entitled to expect from a firm that has always led the Diamond Dies industry. They want to prove that, with **Balloffet,** "QUALITY" and "SERVICE" are not mere words but real facts.

Hallden

Flying Shear Automatic Wire Straightening and Cutting Machine



For handling all kinds of ferrous and non-ferrous wire. The wire does not stop while being cut off, thus producing an absolutely uniform diameter rod from end to end, free from markings or bulges. It is not necessary to stop the machine when starting or finishing a coil of wire, due to our specially designed straightening flyer. The rods are cut to accurate length at a speed of 100 feet per minute. Each size machine will handle a wide range of wire diameters. Rotary flyer made of .50 carbon machinery steel. All fast running parts mounted in heavy duty ball bearings.

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COME AND EXCHANGE IDEAS! SEE HOW THE OTHER FELLOW DOES IT!

See the Latest Improved Machines as Exhibited by Morgan Construction Co., Sleeper & Hartley, Inc., and others.

Hear Kenneth Lewis, Vice President of Morgan Construction Company tell about processes and things which "can't be done" as being actually accomplished in European Wire Mills.

Come to the Technical Sessions and learn—Look over this interesting program—

Technical Sessions Iron and Steel Exposition and Convention, Buffalo, N. Y., June 16-20

Wire Section, Technical Session, Wednesday, June 18th, 1930.

A paper by Kenneth B. Lewis, Vice-President of the Morgan Construction Company, Worcester, Mass., on the subject of drawing wire rods. Mr. Lewis returned from a tour of inspection of European wire mills on April 8th, and will present a very interesting story about the differences in practices existing between European and American mills.

Clarence S. Arms, consulting engineer on wire drawing equipment, Sleeper & Hartley, Inc., Worcester, Mass., will present a paper on the subject "Recent Developments in Wire Drawing and Wire Forming Machinery".

A paper on "Galvanizing" by W. H. Spowers, Jr., consulting engineer on galvanizing and associate editor of WIRE & WIRE PRODUCTS.

A motion picture entitled "The Making of Steel & Steel Wire" with an informative talk by a representative of the American Steel & Wire Co.

A motion picture on "Monel Metal and Its Uses" with a talk by a representative of the International Nickel Company.

You are invited to come, learn and participate!

Manufacturers interested in exhibiting can obtain full information from—

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WIRE & WIRE PRODUCTS

A monthly publication devoted to wire drawing and wire forming

Vol. 5 May 1930 No. 5

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WIRE
& WIRE PRODUCTS

Devoted to the Production and Fabrication of Wire

Vol. 5 MAY, 1930 No. 5

Manufacturing Tape-Armored Cable for Underground Use

Materials and machine for building up cable which is laid underground without conduit

WHEN cables are to be laid underground without conduit they must carry their own protection against dampness and water as well as their own armor against shocks or blows of any kind, also against attacks by ignorant laborers or others who might dig in the vicinity of the cable. Moreover such protection must be of a nature that will provide electrical insulation. Cable of this kind is called tape armored because included in the many coats put around it for one or the other of these purposes are several layers of steel tape. It is called this also to distinguish it from cables armored in other ways, as for instance with fine steel wires in two or more outer layers.

Tape-armored cable is primarily lead-covered long-distance cable with successive coverings, of asphalt, jute, impregnated paper and steel tape,

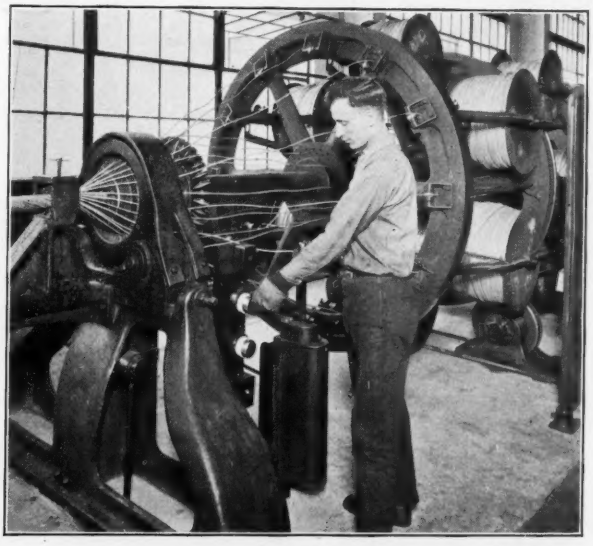

Fig. 1. (at left) Insulating the Telephone Wires Used Within the Lead Sheath.
Fig. 4 (above) Applying the Outside Wire Armor to Submarine Cables, a Method Replaced by Steel-tape Armoring in This Case.

MASTER FIRTHALOY DIES

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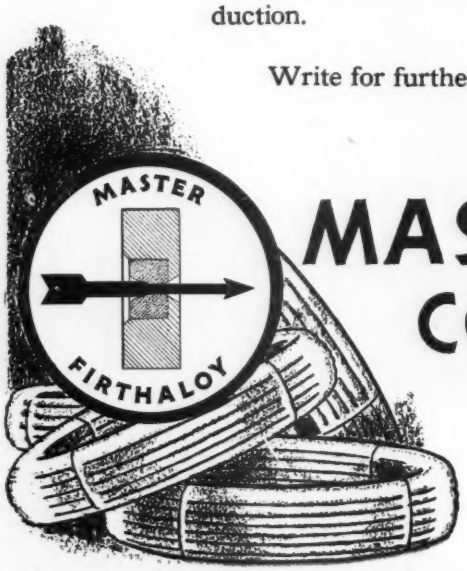
WHEN keen competition reduces profit margins and it becomes necessary to cut production costs, FIRTHALOY MASTER DIES offer a means that the user of drawing dies should consider seriously.

FIRTHALOY *Tungsten Carbide in Master Patented Drawing Dies* affords a distinct economy in wire and tube drawing. Tremendously hard Tungsten Carbide nibs are accurately fitted into heat treated stainless steel casings. The *Master Patented Nib* eliminates shouldering, facilitates lubrication, reduces the power required for drawing and greatly increases the life of the die.

Automatic machinery of special design eliminates the personal element in the manufacture of FIRTHALOY MASTER DIES. Exact duplicates of any die in any quantity desired are assured by this automatic production.

Write for further data on FIRTHALOY DIES.



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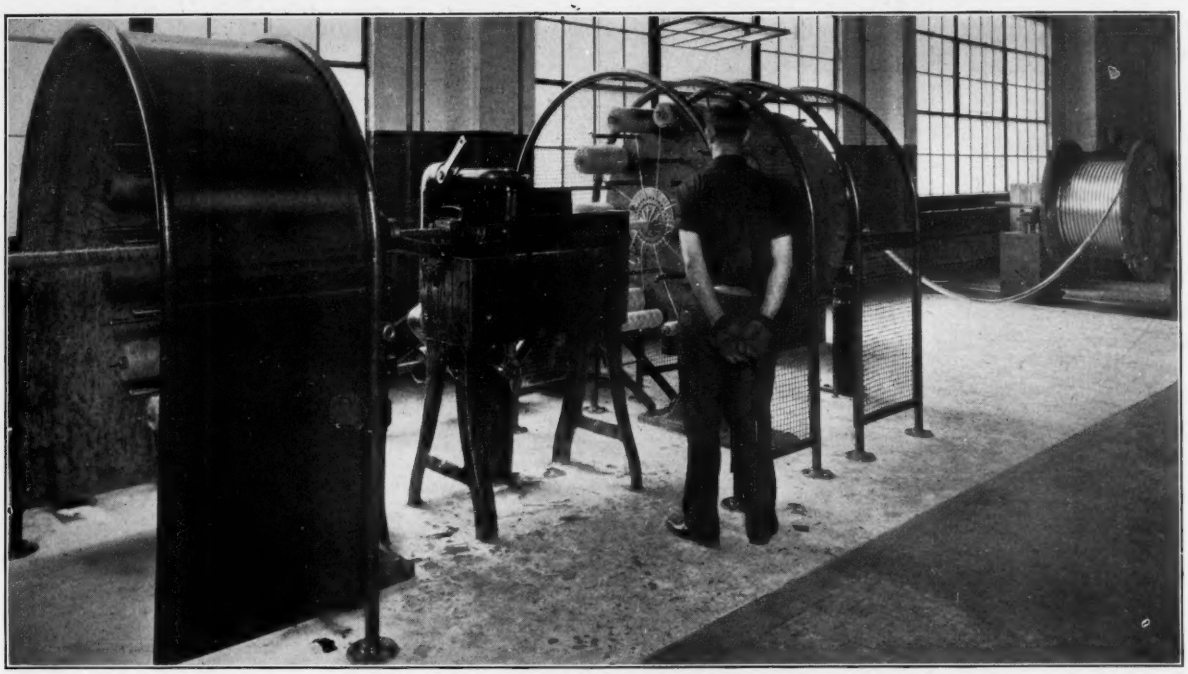


Fig. 2. Machine Applying Jute Bedding to Cable, One of the Earliest Protectors Applied over the Lead Sheath. This Is Followed by a Coating of Tar, the Tar Tank Being Shown at the Left.

and further coverings of asphalt-impregnated jute yarn outside of the tape. The sole purpose of all these coatings, put on with an elaborate set-up of machines and necessitating considerable floor space and a number of men, is to protect lead sheath and its contents from earth and water corrosion and mechanical damage, as stated.

Where We Get the Insulating Materials

Asphalt is a more or less familiar product. Roofs and highways are surfaced with it; it is used for sealing radio transformers and batteries, for water-proofing processes the world over; it is used as a protective paint on structural steel. The ancient Egyptians used it for embalming, presumably with full knowledge of its water-proofing qualities. It is found in natural state in Trinidad, West Indies.

In the process of armoring the lead-covered cable is pulled through a tank containing the asphalt compound. This gives it a covering of the compound

(*Please turn to page 174*)

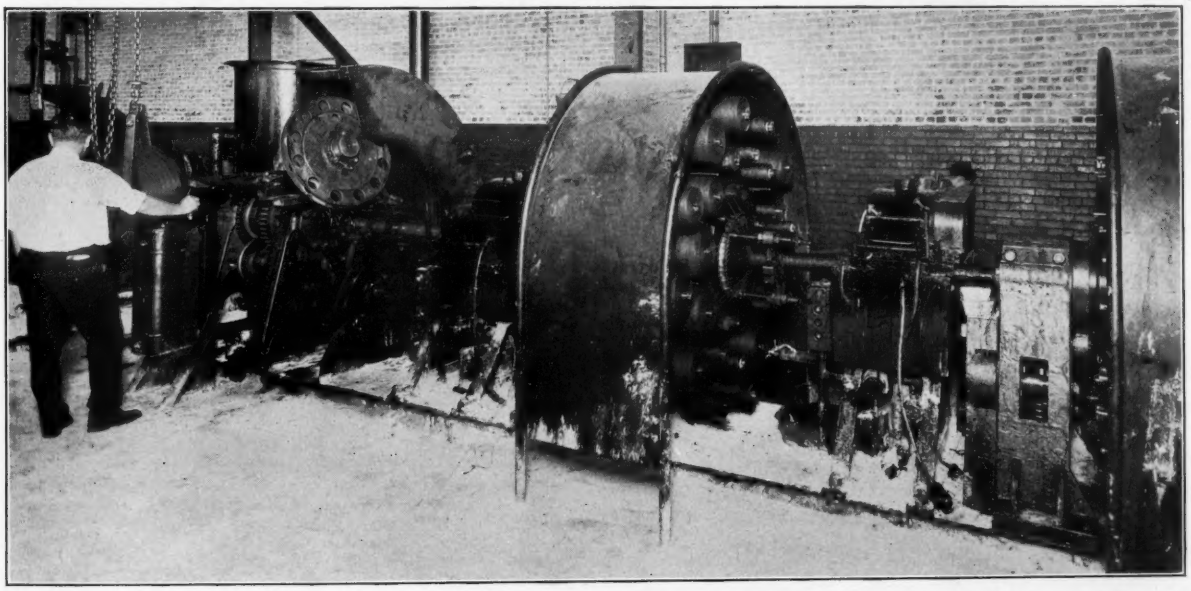


Fig. 4. Tape-armoring Unit, Showing Two Front Jute Applying Machines at Right and Steel Tape Armoring Head at Left, with Tar Tanks between Jutes Also between Jute and Armor.

British Developments in 1929

Technical Research---Rope-Winding Equipped With New Brakes---Magnetic Testing on the Job---Submarine Cables

By A. C. Blackall

THE British mining industry was responsible for the chief technical developments made in the wire manufacturing industries of the United Kingdom last year. Research work on wire ropes for mine haulage was continued by the Safety in Mines Research Board at the Imperial College of Science, London. As a result there has arisen a new conception of the microstructure of rapidly cooled steels, according to which it is assumed that the rate of cooling must be directly related to the iron-carbon diagram. An account of the investigation was given by A. T. Adam at the fall meeting of the Iron and Steel Institute. It is now considered that fatigue or failure by slow fracture is the most common influence, and investigation is proceeding both in the United Kingdom and in Germany with regard to the effects of kinetic shock stresses. Anti-corrosive wire ropes have proved very economical at some of the more modern of the Welsh collieries.

Two new features of interest were embodied in wire rope-winding equipment supplied by the Metropolitan-Vickers Co. to the Roan Antelope Mines in Northern Rhodesia last year. One is the use of a new type of slip regulation consisting of a hydraulic coupling between the motor and the flywheel and the motor-generator set—a development of the well-known Vulcan coupling employed for marine propulsion and industrial drives. The other feature is a new system of braking, wherein the braking effort is applied as a function of the speed change of the cages, compensation being made automatically for all variations of load, speed of travel, and other conditions. Tests in service have been carried out on the large Metrovick winder at Harworth.

The imminence of the shortened working day has induced many owners to pay attention to the mechanical conveyance of workers to the face. In steep roadways overwinding devices, similar to those used on steam winding engines, have been adopted.

At Sheffield Dr. T. F. Wall, as previously mentioned in Wire and Wire Products, has developed an interesting electro-magnetic method of testing wire ropes in situ for internal flaws, and it has been suggested that the device might be incorporated in the portable welding outfits which are now at the service of the collieries. It is also worthy of note that the British Engineering Standards Association during the year issued standard specifications for colliery flattened strand winding and haulage ropes.

In an entirely different sphere of industry—that of the telephone—there are a number of interesting developments to report. The engineering department of the Post Office (which operates the British telephone monopoly) and its specialized contractors last year carried out a vast amount of work for improving the telephone and telegraph facilities of the country. The contracts placed for the installation of engineering plant totalled in value £3,707,000 ($18,535,000), and all were awarded to British firms. Ducts aggregating about 630 miles were laid in roads which were excavated to the extent of 260 miles, and 500 miles of main underground cables were laid containing 40,800 miles of pairs of conductors for trunk and toll service use. For local underground lines approximately 2,160 miles of duct were laid, and cables with a wire mileage of 750,000 were drawn in.

A submarine cable was laid between Blackpool and the Isle of Man to provide telephonic communication with that island, and as part of a new route to Ireland. The cable is continuously loaded, paper-insulated, and lead-sheathed.

At the National Physical Laboratory work was continued throughout the year on the application of X-ray analysis to industrial problems, including the structure of steel wire and a variety of materials used for insulation. Reports on these various materials will be issued in due course and shold provide new data of considerable value.

The British Non-Ferrous Metals Association has instituted a development section, intended to be devoted to facilitating in the works of its members the application of the results obtained by research, and experience during the year showed its operations to be profitable to its members. The activities of the association are likely to be increased by the establishment of a central headquarters in London. The entrance of the Imperial Chemical Industries combine into metal manufacture stimulated rationalization in the industry, and already practical results have followed. The year also saw further progress in the work of the association's Atmospheric Corrosion Research Committee.

The investigation of aluminum alloys continued steadily, though without yielding any new results of outstanding importance. The industrial ap-

(*Please turn to page 184*)

Coloring Wire Gauze

Similarity of Mechanical Coloring to Printing Press Work—How the Gauze Is Handled—Floor Space Needed, Other Details

GAUZE coloring is one of those technical branches of work that cause difficulty for the engineer when installing new machinery as well as when the department is running. The problem to be solved is less dependent on working knack than upon years of experience, perhaps more so that any other auxiliary branch of the wire industry. In this work one constantly encounters new and un known conditions of manufacture.

Coloring or painting of gauze may be effected by hand or machinery but the former is so unsatisfactory for present-day conditions as to be used only in very small plants or on very small jobs, and is mentioned chiefly for the sake of completeness. It is carried out with a paint brush with which the color is applied to the roll of gauze stretched to its full length, rubbed over with color and then allowed to dry in the air. This naturally requires considerable time and entails considerable experience, besides which an irregular product is produced, and can only be described as an irrational method.

Engineer Otto, in *Draht-Welt*, Halle-Saale, Germany.

Machines Used and Methods

Gauze coloring is to-day carried out most rationally and in the best quality on coloring machines working in a similar manner to a book printing machine as hereafter described. The coating color is applied by two cylinders working in opposite directions which are fed by a color cylinder taking up the color from the ink box. The color cylinder is movably mounted and works in conjunction with a scraping device. A portable stretching block with running-off cylinder is employed with the coloring machine, a number of carrying supports according to the length of the work, each support with two running off rollers, and finally the drying plant with stretching devices in a number according to the output. The coloring and running-off cylinders are made of cast iron, the running-off rollers and carrying supports mostly of wood, the printing cylinders have an iron core on which the printing composition is cast.

The mechanical arrangement is therefore very simple. The working operation is as follows: the rolls of gauze to be colored are connected up by means of wire pins, to form an endless band, after having been first

(*Please turn to page 176*)

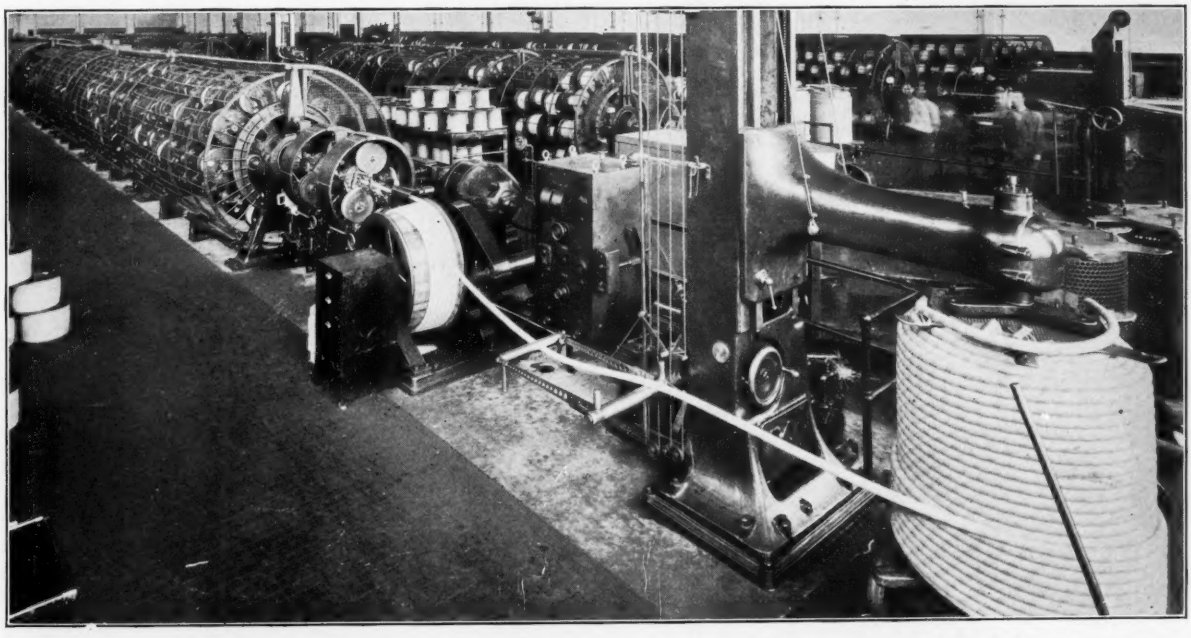


Fig. 6. Stranding Machine Room of Western Electric Plant at Kearny, Showing Size of Machine Used to Cover Lead Cable Sheaths with Various Protective Coats. See Article on Pages 157 and 159.

Hard-Metal Dies for Wire Drawing

Details of a New Series of Tungsten Carbide Dies with Remarkable Performance Records—How Nibs Are Inserted—New Approach Angle

*By S. C. Lawson**

DIAMOND drawing dies are expensive, particularly in the larger sizes. Chilled iron dies wear rapidly, and within a few hours must be discarded, and a new set placed on the machine. These two factors led to the search for a hard metal composition suitable not only as a replacement for the diamond but also for use in drawing large gauge wire and rod.

Early research in producing drawing dies brought successful results using a compound of 75-95% tungsten with 25-5% cobalt. Another hard metal successfully used was an alloy composed of tungsten carbide and an agent having a lower melting point than tungsten as a binding material, such as nickel, cobalt or iron.

The value of the new cemented tungsten carbide, for drawing round wire, rod and tubing was recognized early in our research. This material, produced through pressing and sintering, is harder than the cast carbide and more homogenous. The characteristics of the alloy,—extreme hardness, absence of temper, ability to take a high polish, all pointed to an exceptional die material.

*Chief Engineer, Carboloy Co., Inc., New York City.

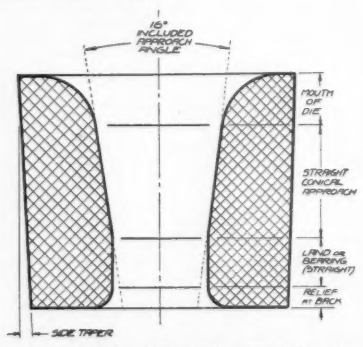


Fig. 1. Section Developed Especially for Carboloy Cemented Tungsten Carbide Use.

Research and Engineering Work

Experience soon proved that cemented tungsten carbide was an ideal die material. Dies were produced and sold but before any announcements were made many million feet of wire were drawn under actual mill conditions. We learned that with our dies production could be greatly increased, that higher drawing speeds could be used, heavier drafts taken, and that the quality of the finished product was improved.

The results obtained from field tests were in general favorable but they were not uniform. The dies used were not of the same shape, but were made to the shapes currently used in the respective mills. Dies are usually produced by rule of thumb. We felt that the importance of correct die design was too generally overlooked, and that our first problem was to standardize on a shape that would produce wire of satisfactory quality.

A group of engineers were assigned to die research. As a starting point it was decided to investigate the drawing of copper, and to apply the results obtained in that limited field to the other materials, such as iron, steel, brass, bronze and the precious metals. A number of chilled iron dies were secured from the line in mills successfully drawing copper. These dies were sectioned and carefully studied.

Fig. 1 illustrates the terms used hereinafter—the land, approach, approach angle, mouth, relief, etc.

A careful examination of the sectioned dies disclosed several interesting facts. The dies examined were of various designs, yet in all cases the act of drawing wire through these dies had resulted in a change of contour which can best be illustrated by a consideration of Fig. 2. Assuming that the original shape of the die was the heavily curved line, the wear of the die was such that the sectioned portion followed the light line, and the included angle was found to vary from 15° to 18° in nearly all cases. It was evident that much of the effort originally expended was used to reshape the die in actual service. The heavily shaded portion indicated on Fig. 2 shows the material removed.

New Die Contour Developed

Theoretical calculations confirmed the results outlined above, and our engineers decided to manufacture some dies

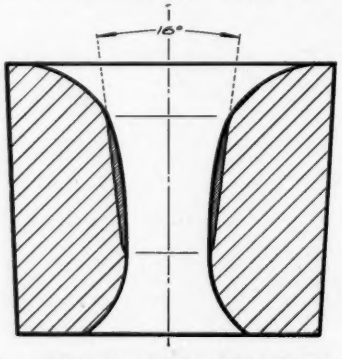


Fig. 2. Die Section Showing Initial Wear on Nibs in Usual Dies.

for trial of a design radically different from that of any hard metal composition dies being used. A number of dies were constructed in accordance with the shape indicated in Fig. 1, having a 16° included approach angle, a straight land, a bell at the mouth of the die, and a slight relief at the back. These dies proved successful in actual practice. In a number of cases where our dies of different shapes had been unsuccessful, a replacement was made with dies of the new shape with satisfactory results.

Although the original tests with this shape were conducted on the drawing of copper wire, dies of the same design were successfully used in the drawing of steel wire and rod, and steel tubing. The only changes necessary to make this design applicable to materials other than copper were a variation in the length of the land, the extent to which the mouth is belled, and the relief at the back of the die.

Specifications of New Dies—"T" Series

Toward the end of 1929 it was felt that the new die design had been tried under actual operating conditions, and that it had proved itself. A new line of dies, designated as the "T" series, was designed, and an

NIB SYMBOL	SIZE OF NIB		APPROX. GROSS WEIGHT OF SOLID NIB
	D DIA.	H HEIGHT	
	IN.		GRAM
T 1	.300	.300	4.95
T 2	.400	.350	10.20
T 3	.500	.400	18.30
T 4	.600	.500	38.80
T 5	.750	.600	61.40
T 6	1.250	.750	213.00
T 7	1.500	.875	358.00
T 8	1.750	1.000	556.00

Table 1.
Proportions of Nibs in the Carboloy "T" Series of Tungsten Carbide Dies.

Jan. 1, 1930, a new price list covering the dies of this series was released.

Such a die consists of a cylindrical piece of Carboloy cemented tungsten carbide termed a "nib," and a metal holder or "casing" into which the nib is fastened. The nibs are standardized by size of diameter and height. Each nib will accommodate a large range of hole sizes. The nibs of the "T" series are eight (8) in number, and the diameter, height and weight of the solid nib are indicated in Table 1, which is further clarified by reference to Fig. 3.

All dies of the "T" series are made with a straight conical approach with a 16° included approach angle. The extent to which the mouth of the die is belled, the length of the land, and the relief given the back of the die, are influenced greatly by existing mill practice. The character of the material to be drawn, the lubricant used, the drawing speed, and the type and condition of the machine or bench, are but some of the factors affecting the contour of the finished dies.

Larger Number of Recuts Possible

The initial cost of the die is relatively unimportant when calculating mill costs. By selecting the proper nib for the work to be done, bearing in mind not only the initial size of the wire to be drawn but the maximum size to which it is desired to open the die, full advantage may be taken of the life of the nib. An important consideration in the proper selection of the nib is the percentage of draft in one pass. (Draft is defined as the increase in length from one pass, expressed as a percentage of the original length).

Material to Be Drawn

Carboloy dies have been used most successfully in drawing the following materials in the sizes specified:

1. Copper wire—down to .064 in.
2. Phosphor bronze wire—down to .020 in.
3. Low carbon steel wire—down to .0108 in.
4. Copper rod, drawing from .250 in. down.
5. Steel rod — drawing from .310 in. down.
6. Commercial tubing (steel) up to 1.250 in.
7. Specification tubing (chrome-molybdenum) up to 1.250 in.
8. Pure nickel tubing—.375 in. and smaller.

In the design of this new series of dies and the compilation of the price list covering

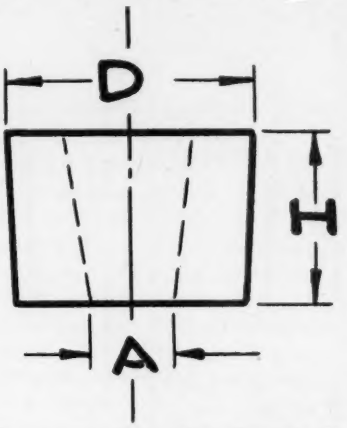


Fig. 3. The Three Most Necessary Die Dimensions. See Table 1.

same, a radical departure was made. By the use of improved manufacturing methods it was found possible to make the nib with the 16° cone already formed. By varying the dimension "A" Fig. 3 during the manufacturing process, the size of the cone can be predetermined and more nearly approximate that required for the finished die of a particular size. Thus in any chosen size of nib we have passed along to the customer a material saving, for the larger the size of the wire to be drawn through the die the lower the cost of the finished die.

What Die Makers Should Know

This company is most desirous of successfully serving the customer. Our sales engineers are ready to help with die problems. Our research engineers need the information that the customer alone can give. The more complete the information which we receive with an order the better our opportunity to serve well. We should know:

1st—The material to be drawn.
2nd—The diameter of wire, rod or tubing before drawing.
3rd—The lubricant used.

(*Please turn to page 180*)

Clarifying the Wire Cable Question, II

Influence of Cable Loads—Greater Satisfaction from Thicker Wires (American Practice) for Elevator Service

By R. Woernle, Stuttgart *

In the first installment which appeared in the April issue the author outlined the general problems in connection with industrial uses of wire cables and described the general plan of testing cross-wound and direct-wound cables, giving in addition an extensive table describing the thirty-odd cables tested. The first items given serious consideration were the diameter of the groove base and the influence of the method of winding the cable.

THE direct-wound cable A. L. 16, DIN 655, groove base radius of 8.5 mm. and 50 mm. showed a similar decrease of life, comparable to Fig. 12. These findings made plain what appreciable influence the form of the groove base of the pulley exerts on the life of the cables.

Some of the following experiments were made in order to determine the limitations, with 8.5 mm. as well as with 50 mm. groove base radius.

Also in the following series of experiments were direct and cross-wound cables used. The superiority of the direct wound cable is always evident.

Influence of Cable Loads

Figure 18 shows, in consideration of diameter of pulleys, the course of the duration of life of a cross wound cable (A 16 DIN 655), tensile strength 130 kg/mm. at a specific cable load of Oz of 20 to 60 kg/mm.

In the series of experiments in Figs. 20-23, attempt was made to investigate the influence of thickness of wire and number of wires on the duration of life of cables, both for cross wound and direct wound and for groove base diameter of 8.5 and 50 mm.

After a solution of the problem it will be possible to specify a certain cable diameter favorable for cables in practice.

The cables exposed to a spec. cable load of Oz of 30 kg/mm. of equal cable diameter (16 mm.) and equal tensile strength (130 kg/mm.) had 366 to 16 wires, and wire thickness of 8.56 to 2.5 mm.

The duration of life expressed in Figs. 20-23, in consideration of the thickness of wire, shows at a certain wire thickness, or number of wires, a greatest duration of life and indeed this high value makes itself plain with increasing size of pulleys of 300 to 500 mm. (groove base rad. 8.5 mm.) and of 400 to 600 mm. (groove base rad. 50 mm.)

In the case at hand the cable considered best is the cable of 114 wires (1 mm. wire thickness) cross wound, 500 mm. pulley diam. and 6.5 mm. groove base rad.

With the direct wound cable, the 114 wire cable of 1 mm. wire thickness, with pulley diameter of 300 mm. is best.

At 50 mm. groove base radius, the duration of life naturally falls in comparison with the series of experiments at a suitable groove base. The greatest value shifts in the direction of increasing wire thickness—cf. Figs. 23 and 25, because the cable with thicker wires can better withstand the unfavorable pressure in flat grooves.

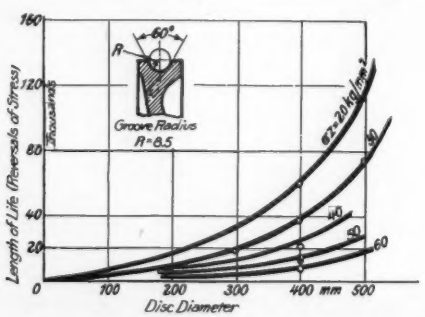
The 42 wire cable with 1.65 mm. wire is advantageous.

Cross wound—500 mm. pulley diameter

Direct wound—400 mm. pulley diameter.

In freight cables, where the cable does not surround the car-

*Chairman, V. D. I. Wire Rope Committee. From *Zeitschrift des Vereins Deutcher Ingenieure.* Translated by W. H. Fulweiler, United Gas Improvement Co., Philadelphia.



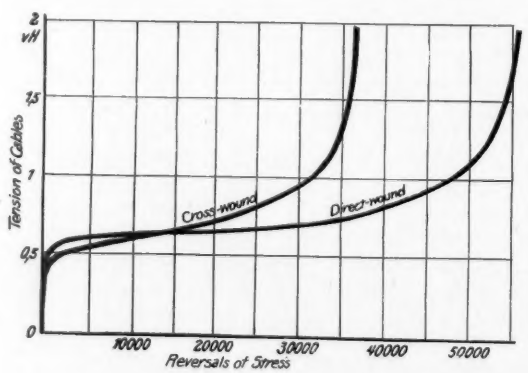
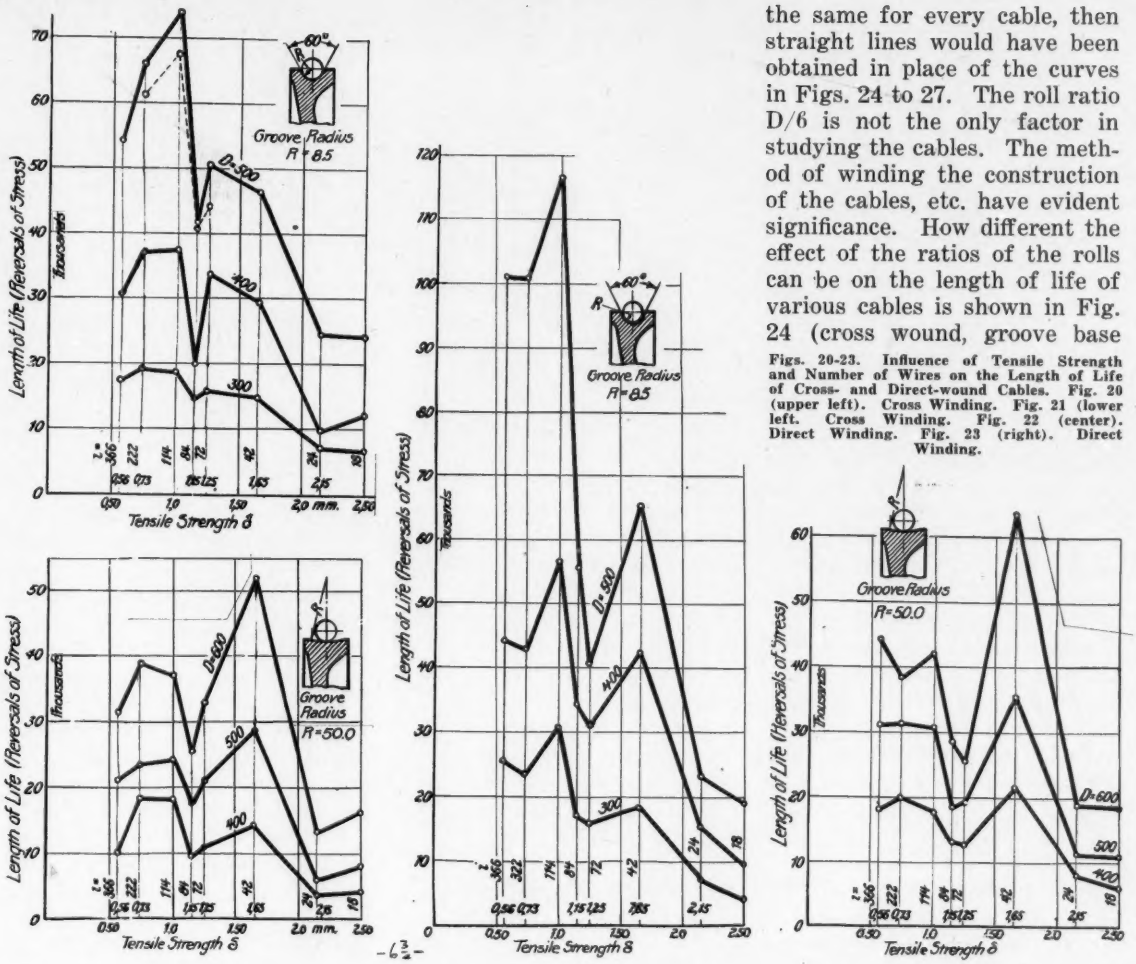


Fig. 18 (above). Influence of the Cable Load on the Length of Life of Cross-wound Cable in Consideration of the Pulley Diameter. Fig. 19 (at right). Cable Tension in Consideration of Bending Changes (Reversals of Stress).



Figs. 20-23. Influence of Tensile Strength and Number of Wires on the Length of Life of Cross- and Direct-wound Cables. Fig. 20 (upper left). Cross Winding. Fig. 21 (lower left. Cross Winding. Fig. 22 (center). Direct Winding. Fig. 23 (right). Direct Winding.

rying rolls, 42 wire cables are used as traction cables and this seems sensible according to the findings of this experiment, since there also, the carrying rolls found on the stretch have great grooves.

The steep decrease in life of cables with 84-72 wires is founded on their method of construction. See cross section Fig. 5 and 6. In further experiment this will be of special significance because these cables are used for traction cables and for passenger car cables.

For the determination of a given ratio, delta (δ) equals.

$$\frac{\text{(Diameter of pulley)}}{\text{(Thickness of wire)}}$$

for the measurement of the diameter of the pulley or of the drum, it is quietly assumed in practice and in text books that the demands (Inanspruchnahme) of cables of any given construction and various methods of winding are the same for equal delta as the cables run over the pulleys or drums in practice.

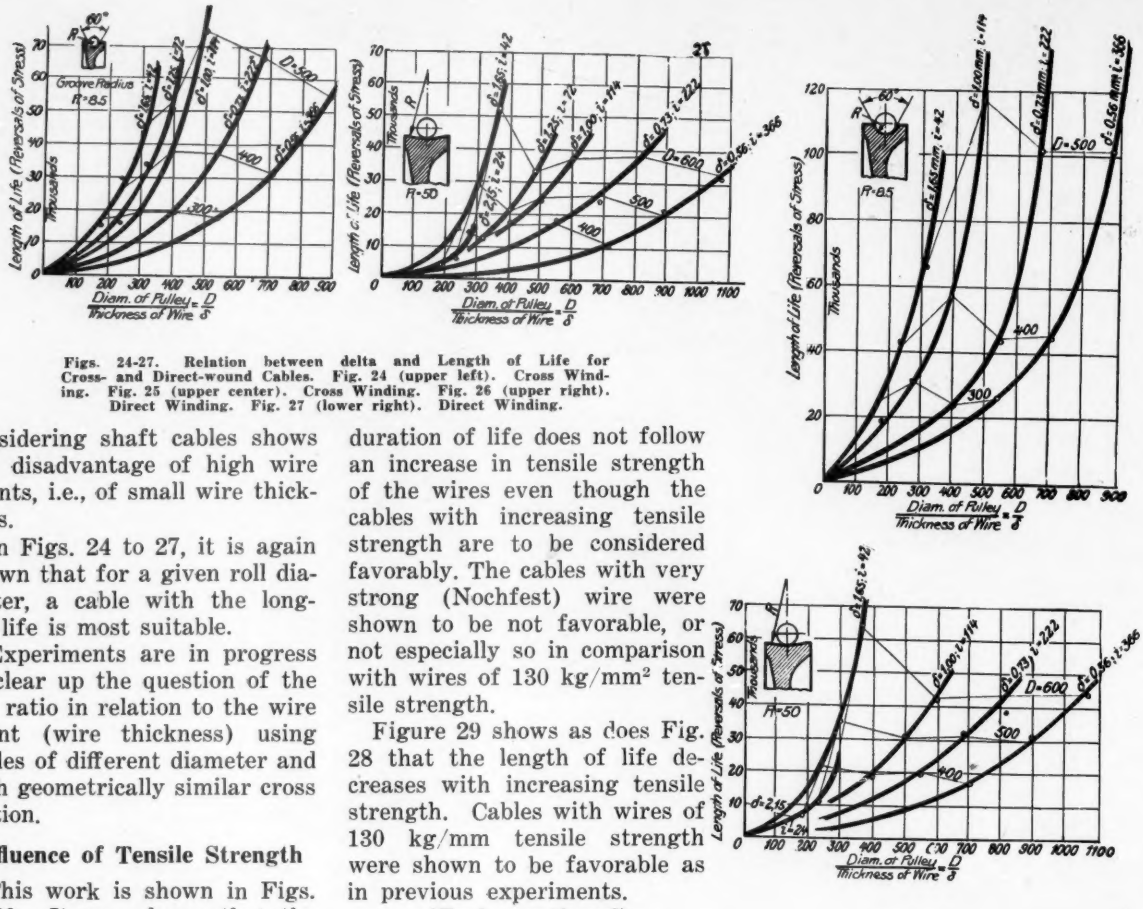
In order to get an insight into the roll ratios D/6 and the length of life of cables of various wire thickness and various wire counts, the duration of life of cross and direct wound cables is shown in Figs. 26 and 29, taking into consideration the ratio D/6. Cross and direct wound cables of equal tensile strength (130 kg/mm²) at equal cable diameters, 30 kg/mm² specific load, groove base radius 8.5 and 50 mm. were used.

The experimental results show that in a definite ratio D/6, the cables show a significantly different demand, i.e., length of life. If the working out of the roll ratio D/6 were the same for every cable, then straight lines would have been obtained in place of the curves in Figs. 24 to 27. The roll ratio D/6 is not the only factor in studying the cables. The method of winding the construction of the cables, etc. have evident significance. How different the effect of the ratios of the rolls can be on the length of life of various cables is shown in Fig. 24 (cross wound, groove base rad. 8.5 mm.) whereupon, for example, the length of life of the 366 wire cables with=0.56 mm. at the roll ratio D/6=900 is the same as the 42 wire cable with =1.65 mm. at D/6=340, i.e., 56,000 reversals of stress.

Still more pronounced are the ratios in Fig. 25. Here indeed the length of life (32,000 reversals of stress) is the same at D/6=1070 as D/6=310. The same is true in the case of direct as with cross wound cables.

The above discussed comparisons were concerned with cables of thin wires which as experiments show were unsatisfactory. On unwinding of German cables, it was found that the American elevator cables of thicker wires in the outer strands were more satisfactory and German cable makers were officially restricted. Herst[1] in

[1] z. vol. 72,345 (1928.)



Figs. 24-27. Relation between delta and Length of Life for Cross- and Direct-wound Cables. Fig. 24 (upper left). Cross Winding. Fig. 25 (upper center). Cross Winding. Fig. 26 (upper right). Direct Winding. Fig. 27 (lower right). Direct Winding.

considering shaft cables shows the disadvantage of high wire counts, i.e., of small wire thickness.

In Figs. 24 to 27, it is again shown that for a given roll diameter, a cable with the longest life is most suitable.

Experiments are in progress to clear up the question of the roll ratio in relation to the wire count (wire thickness) using cables of different diameter and with geometrically similar cross section.

Influence of Tensile Strength

This work is shown in Figs. 28-29. It was shown that the duration of life does not follow an increase in tensile strength of the wires even though the cables with increasing tensile strength are to be considered favorably. The cables with very strong (Nochfest) wire were shown to be not favorable, or not especially so in comparison with wires of 130 kg/mm² tensile strength.

Figure 29 shows as does Fig. 28 that the length of life decreases with increasing tensile strength. Cables with wires of 130 kg/mm tensile strength were shown to be favorable as in previous experiments.

(To be continued)

Miles of Copper Wire in Huge New Transformers

FOUR of the largest electric power transformers ever built were constructed recently by the Westinghouse Elec. & Mfg. Co., at its plant in Sharon, Pa. The transformers, rated at 220,000 volts, were tested at 570,000 volts, the highest test voltage which has yet been applied to a power transformer.

These four units together contain 60 tons of copper windings for cores and coils. There are more than 32 miles of copper wire weighing 15 tons, in the windings of each transformer. In addition to the copper wire and the brass and copper terminals in the electric circuit, heavy t-beams of cast bronze were used to brace the coils. Bushing flanges of cast bronze were used on the cover to prevent high magnetic losses which would occur if other materials were employed. Terminal bushings also contain copper and brass.

Westinghouse engineers estimate that the four transformers have a winding capacity sufficient to provide power for the illumination of all the homes in a city of 400,000 population. These enormous units have been constructed to transform power at the Pennsylvania Power & Light Co.'s plant in Bushkill, Pa., to the New Jersey system of the Public Service Elec. & Gas Co.

Revised Simplified Practice in Skid Platforms

At a recent meeting of the standing committee on the simplification of skid platforms it was unanimously decided to revise the Simplified Practice Recommendation as originally adopted and to submit to the industry for its signed acceptance, United State. The entrance salsions: Clearance from bottom of runners or other supports to under side of skid platforms be either 8 or 12 in.; and between inside of runners or other supports be 29 in.; Over-all dimensions for skid platforms used for shipping goods be either 33 in. by 54 in. long or 42 by 66 in. long. Changes are to be effective from March 1, 1930.

Lime for Wire Drawing

Forms and Types of Kiln Used in Lime--- Preparation of Lime and Influence on Product

*By D. E. Washburn**

IT IS superfluous to assert that a workable lime should be free, or as nearly free from grit and abrasive particles as it is possible for the lime manufacturer to produce. To one familiar with the commercial manufacture of lime it is glaringly apparent that the methods and controls employed during the manufacturing process decidedly influence the production of abrasives. We will, therefore, deal more particularly with the part that the manufacturing process plays in producing a product adaptable to wire drawing. Before doing this, it will be necessary to give some thought to the impurities which are native to limestone deposits, as well as the impurities that creep in from foreign sources.

These consist for the most part, of silica and oxides of iron and aluminum. To those not so familiar with the commercial manufacture of lime, it seems advisable to state that the process involves the extraction of enormous tonnages of limestone from their sedimentary deposits, these being subsequently subjected to relative high temperatures for the conversion of carbonate into lime. Silica is the most prevailing native impurity and it may be found dispersed throughout the deposit either in minute, native quartz crystals, or in the form of feldspar.

Aside from this native contamination there may be a contamination from the overburden consisting of clay and dirt which invariably overlie limestone deposits. Open quarry methods for reclaiming the limestone are incapable of entirely eliminating this source of contamination, and it is only through actual mining operations which extend well below the surface into the pure native limestone that this form of impurity can be entirely avoided.

Even the Kiln Lining Contributes Impurities

One more source of contamination exists in the refractory kiln lining with which more or less of the product must come in contact during the manufacturing process following the quarrying or mining of the limestone. Refractory linings are essentially silica and iron and aluminum oxides. Whatever the sources of the impurities, the temperature, time and control of manufacture largely determine whether the impurities are fluxed to the formation of abrasive silicates, or whether this fluxing action is arrested before material of a highly abrasive nature is formed.

We are here stressing somewhat the item of silica, but it must be remembered that the oxides of iron and aluminum are also fluxible in the presence of lime so that the same line of reasoning applies to them. There are no deposits of limestone entirely free of silica, but there do exist deposits analyzing under one percent in this element, and in very rare instances as low as .5%. This latter figure usually applies to strata of Limestone of very limited cross section—too limited to make economical production practical. Deposits analyzing approximately .8% silica when properly protected from contamination and subjected to the proper manufacturing control should yield a product adaptable to wire drawing. It should be remembered, however, that a limestone of approximately .8% yields a burned lime of approximately 1.3% silica, due to the fact that the decomposition of the limestone entails a loss of carbon dioxide.

Burning Factors Important

In order that the product be workable it should be completely burned without subjection to abnormal high temperatures. Time and temperature of burning are important factors. High temperatures of short duration are more injurious than moderate temperatures of fairly long duration. The old fashioned wood-burned lime was an ideal product, because wood as a fuel contained sufficient moisture to mellow the flame. While of necessity the time of burning with wood was of long duration, yet the temperatures were so moderate that the fluxing action already referred to was reduced to a minimum. This, of course, produced a lime which slacked readily to a lime putty that worked up into a milk containing a minimum of grit.

Modern commercial production of lime does not, however, permit the use of wood as a fuel, because the lime manufacturer now is called upon to produce lime economically, and wood is too expensive as a fuel. Consequently, the up-to-date manufacturer employs coal, gas or oil for fuel, and in most instances any one of these fuels is applied to a shaft kiln.

(*Please turn to page 181*)

*Chief Chemist, Amer. Lime & Stone Co., Bellefonte, Pa.

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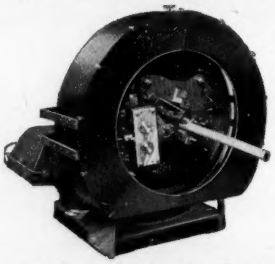
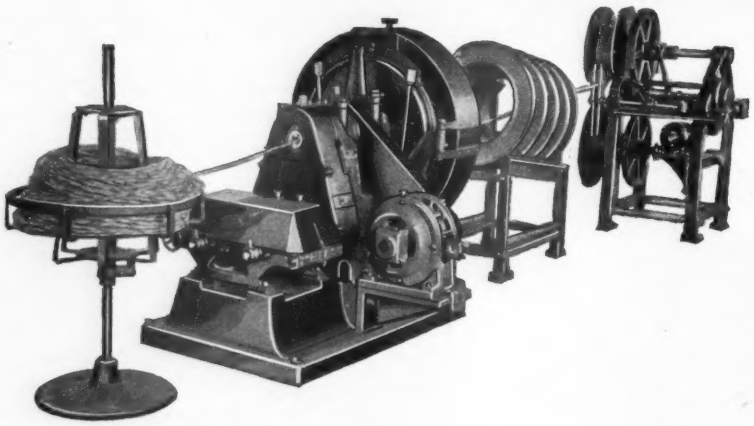
ARMORING MACHINERY

WE MANUFACTURE three types of Armoring Machines. Those which wrap oval or flat strip directly onto the electric wire or wires; the machines which produce the



widely-known "BX"; and those which turn out an armor for parkway cables, rubber hose, rope and wire.

Above is shown an example of this latter armor while at the right is the head which lays the protective covering over the core. These heads are made in two sizes, handling cables from 5/16″ diameter to 3 inches. They lay on from 100 to 300 turns of strip per minute depending on the cable diameter and are equally capable of producing a fine grade of Hollow Flexible Conduit.



Our "BX" equipment has come to be the producer's standard. Of the latest improved type, it is direct motor-driven and very fast and efficient.

This machine will produce an armored form with or without cable or wire inside and can be used for producing Hollow Flexible Metal Conduit.

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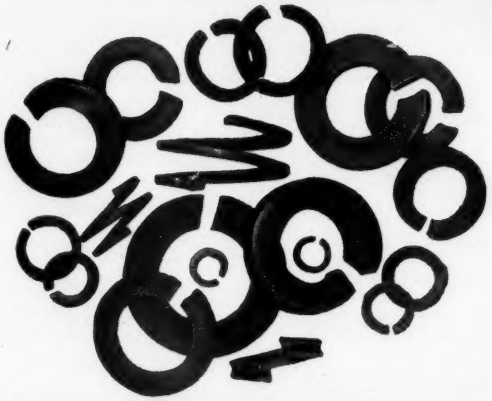
LOCKWASHER MACHINES

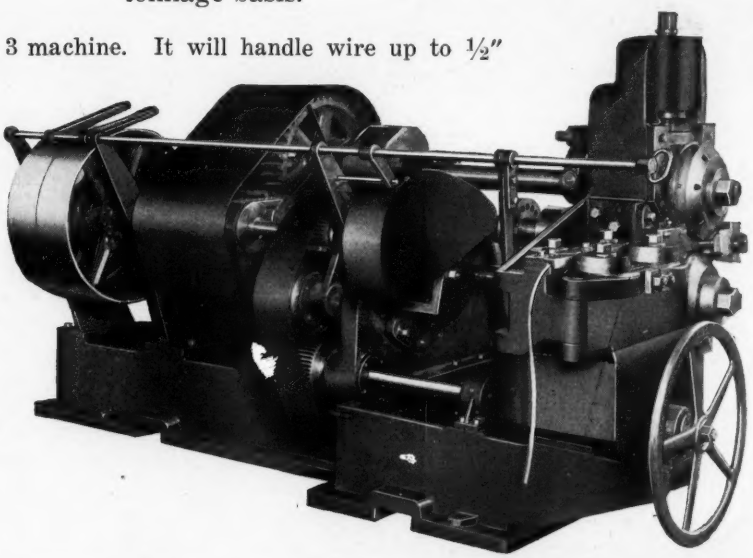


OF THE MANY devices invented for the production of lockwashers, the machine which we manufacture has set new records for quality production and is absolutely without rival in quantity output.

While the speed of production is governed by the size of the wire and the washer, our small machine will turn out 2400 lockwashers a minute.

We make these machines in five sizes and any of them will turn out a variety of washers on a tonnage basis.

To the right will be seen our No. 3 machine. It will handle wire up to ½" square with ease and from this stock will produce 200 washers a minute. This is not an exhibition performance but regular mill production and can be maintained over a long period. A feature of this machine is that it gives practically uninterrupted production. The unbent end of a new wire bundle need only be fed into the machine as each succeeding bundle is used up.



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TEEL SOW OF THE WIRE DIVISION, TO BE HELD AT BUFFALO, N. Y., JUNE 16TH TO 20TH.

NEWS *of the* INDUSTRY

Foreign Trade Opportunities reported by the U. S. Bureau of Foreign and Domestic Commerce during the month of April include inquiries from the following sources: Brass eyelets for fabrics, 300,000 wanted (44368) Mexico City, Mexico; pins, needles, buckles, etc., (44399) Johannesburg, South Africa; steel wire hawsers (44381) Glasgow, Scotland; wire for making nails, bed springs and woven wire fence and wire-working machinery for woven wire fencing, bed springs, nails etc., (44431) Mexico City, Mexico; cord, cable, and low-priced tape (44435) Montreal, Canada; cotton rope and seine twine for fishing purposes (44480) Vancouver, Canada; linen and cotton and steel tape (44399) Johannesburg, South Africa; electric wiring supplies (44589) Toronto, Canada; fasteners for automobile tops, carpets etc., (44510) Turin, Italy; wire nails (44508) Hamburg, Germany; screw manufacturing and pointing machines (44514) Glasgow, Scotland; gems and sapphires in the rough (44532) London, England; transmission line wire and accessories (44652) Cali, Columbia; copper wire and cable (44735) Patras, Greece; insulating wire and cable and insulating materials (44760) Neuilly, France; fence wire-making machinery (44650) Arequipa, Peru; wire working and other metal-working machinery (44650) Dresden, Germany; water-proof varnishes and varnish materials (44830) Milan, Italy; electric wiring supplies (44831) Rome, Italy; electric wiring supplies, wires and devices (44833) Bogota, Columbia; iron and steel bolts and nuts (44893) Kuala Lumpur, Straits Settlements; barbed wire and wire nails (44836) Santurce, Porto Rico; asphalt (gilsonite) for cable makers (44824) Hamburg, Germany; Hairpins and plain pins (44808) Paris, France.

Movies for Buffalo Show in June

At the Exposition to be held in the Broadway Auditorium, Buffalo, June 16-20, among other entertainment provided for those visitors in wire and wire products will be moving pictures taken in the production plants of several of the country's largest producers, notably International Nickel Co. and Amer. Steel & Wire Co. The Nickel two-reel picture, which incidentally features the production of monel metal at the Huntington, West Virginia plant, shows the weaving of fine-mesh wire cloth as part of the picture.

This reel shows the **actual processes** which the raw product goes through and gives a close up view of the plant's equipment in action. Included in this is the tapping of the world's largest non-ferrous electric furnace, showing the pouring of 11 tons of metal at a temperature of 3,000° F.

The films also reveal the many precautions which are taken to insure that the quality of the metal is maintained up to standard. Testing operations to determine the action of various metals under severe conditions of corrosion, fatigue, abrasion, and other stresses is another interesting feature. Additional views show the production of monel metal in its various forms, **including the weaving of fine mesh wire cloth.**

The different uses of the metal are given by photographs of actual installations.

Big 1930 Market for Wire

According to estimates by the Copper & Brass Research Assn., there will be buildings needed in 1930 amounting to a total cost of nine billions of dollars ($9,000,000,000), a fairly large part of which huge amount will be in the form of brass and copper wire, and wire or wire products of other metals. It is estimated that half a billion dollars must be spent to replace buildings destroyed by fire and storm; housing for a new population of 1,650,000 will be necessary; housing and other accommodations for the huge annual shift of people as from farms to cities, this amounting to 4,000,000 persons since 1910; replacement of obsolescent or worn-out buildings may necessitate a billion expenditure; alterations and repairs run into huge sums, while other factors are also taken into the whole account.

A. T. & T. to Spend $106,000,000 on Wires

Construction of long lines by the American Telephone & Telegraph Company in 1930 will require $106,000,000, the company announced. This is part of the $700,000,000 contemplated construction expenditures for the year.

The program calls for installation of about 3,000 miles of cable, more than 1,000,000 loading coils and nearly 28,000 telephone repeaters in connection with new and existing cables. Additional long distance facilities will be obtained from about 760 miles of toll cable to be installed by associated companies.

Steel Show Remains at Stevens Hotel

Final announcement of the place of the twelfth National Metal exposition fixes it at the Stevens Hotel, Chicago, Sept. 22-26. This hotel was originally designated, then considered too small and arrangements were made for Soldier Field stadium. Subsequently the ar-

rangement of space there did not prove satisfactory. Net space now available totals 42,000 sq. ft. including main ballroom, lounge, writing room and main dining room on second floor, and exhibit hall and foyer where operating and heavy exhibits will be located.

Wire Nails Back at Old Prices

During March quotations on wire nails firmed up, and a number of producers quote $2.30 as second quarter basis. When April 1 came however, old contracts were renewed at the $2.25 and lower figures, thus discrediting the new and higher prices. While the extension nominally was until April 15 only, it appears that further extensions have followed, so that the market is now quotable at $2.20 @ $2.30. Plain wire for manufacturing use is moving well, other wire products except nails are in moderate demand.

German Nails and Wire in U. S.

Export prices of wire nails and barbed wire have been reduced recently, and this has stimulated business of German mills with Pacific Coasts and Gulf ports. Exporters in Hamburg have been able to book a fair tonnage of these products, Waukegan type 12½ B W G at $2.72 per 100 lbs. c i f Houston, Tex., New Orleans or Mobile, Ala., and $2.80 c i f San Francisco.

British Wire Trade Spotty

British foreign trade in iron and steel products in January and February was spotty. Imports showed increases in Feb. over Jan. in these products: Wire, wire manufactures n e s, and bolts nuts and screws; and losses in these: Wire nails including staples, nails, tacks, rivets and washers. No wire cable or rope was imported. Exports showed increases in Feb. over Jan. in these: Wire cable and rope, wire nails including staples; and decreases in these: Wire, wire manufactures n e s, nails, tacks, rivets and washers, bolts nuts and screws. Imports showed a net decrease, all wire and wire product classifications, or 950 tons, while exports showed a net decrease of 1,884 tons.

COMING EVENTS

May 1-3. American Gear Manufacturers association. Annual meeting at Hotel Gibson, Cincinnati. T. W. Owen, 3608 Euclid avenue, Cleveland, is secretary.

May 6. Iron & Steel Institute, Birmingham Chamber of Commerce, Sec'y 28 Victoria St., London, S.W. 1.

May 9. American Iron & Steel Institute, 37th General Meeting, Hotel Commodore, E. A. S. Clarke, secretary, 75 West St., New York, N. Y.

May 12-17. American Foundrymen's association. Annual convention at Public Auditorium, Cleveland. C. E. Hoyt, 222 West Adams street, Chicago, is secretary.

May 29-31—57th Annual Meeting of the American Electrochemical Society at St. Louis, Mo.

June 6-7. Annual convention National Association of Foremen, Civic Auditorium and the Chamber of Commerce Building, Toledo, O. Harry J. Baumker, convention secretary, 316 Tenth St., Toledo, O.

June 9-12. Semi-annual meeting of the American Society of Mechanical Engineers at Hotel Book-Cadillac, Detroit, Mich. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

June 16-20. Exposition sponsored by Assn. of Iron & Steel Elec. Engineers at Broadway Auditorium Buffalo, N. Y. John F. Kelly, man. director, 1010 Empire Bldg., Pittsburgh, Pa.

Personal Mention

Leslie C. Whitney has joined the organization of the Copperweld Steel Co., Glassport, Pa., as chief metallurgist.

Mr. Whitney graduated from Lehigh University in 1922 as metallurgical engineer. For the past five years, he has been employed as assistant head of the laboratories for one of the largest wire manufacturers in the country. His work there covered all phases of round and flat wire production, open hearth, rolling, drawing and fabrication of wire products. Mr. Whitney is now supervising the installation of equipment in the Copperweld Steel Company's new research laboratory. This laboratory will combine the chemical, metallurgical, mechanical testing, and heat treating laboratories.

—

Frank W. Curtis, until recently connected with P. R. Mallory & Co., Inc., Indianapolis, Ind., as chief engineer in charge of Carboloy manufacture and developments, has become research engineer with the Kearney & Trecker Corp., Milwaukee, Wis., manufacturer of Milwaukee milling machines.

—

Charles J. Boon has assumed his new duties as manager of sales at Cincinnati for Amer. Steel & Wire Co., Chicago,. He has been with the company 20 years, being assigned to Cincinnati as assistant manager of sales, following the World war, in which he served as lieutenant.

—

H. W. Boyd has been made vice-president and secretary of the Tinius Olsen Testing Machine Co., Philadelphia, Pa. Mr. Boyd serves as superintendent of the Olsen plant.

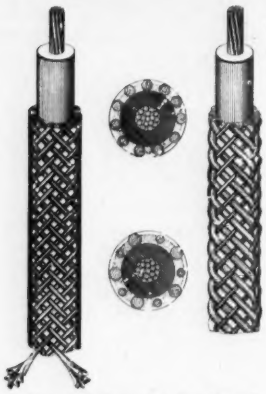
—

Kenneth Lewis, Morgan Construction Co., Worcester, Mass., has just returned from an inspection trip through European wire mills. Mr. Morgan will deliver an informal talk at the wire drawing section conference in Buffalo, June 16-20, on the subject of "Preparation of Rods for Drawing". Into this he will bring some unusual production methods and describe some of the things he has actually seen done although ordinarily listed as things that cannot be done.

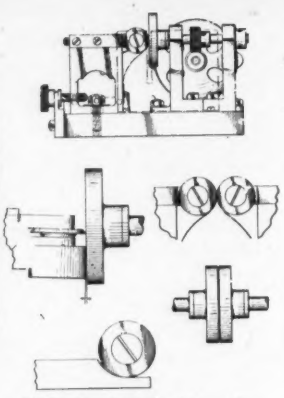
—

W. T. Kyle has resigned as sales manager of Page Steel & Wire Co., Bridgeport, Conn., and W. H. Bleecker Jr. has been appointed assistant sales manager.

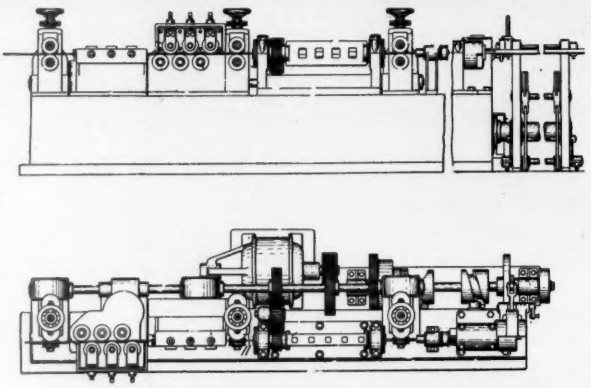
A REVIEW *of* RECENT PATENTS



Frederickson's Insulated Conductor 1,749,740.



Heller's Insulation Removing Process 1,749,939.



Matteson's Wire Straightening Machine Side and Top Views 1,751,094.

No. 1,749,117, SPRING DEVICE. Patented March 4, 1930, by John Weichsel, New York. N. Y. In order to protect wire coil or helical springs against the entry of dust, etc., the inventor provides a somewhat flexible extensible casing, formed by spirally winding a ribbon with its edges in overlapping relation and so adapted for relative movement.

No. 1,749,740, INSULATED CONDUCTOR. Patented March 4, 1930, by Otto A. Frederickson, Wethersfield, Conn. Assignor to The Wire-Mold Co., Hartford, Conn., a Corporation of Conn. The present invention relates to insulated conductors of the type above mentioned, and more particularly to a braided jacket which is well adapted for use on such conductors to protect the insulating rubber. One of the primary features of the present invention resides in a braided jacket that is constructed entirely of twisted strands of paper.

No. 1,749,932, SECTIONAL CONVEYER BELT. Patented March 11, 1930 by Francis N. Woodman, Clinton, Mass., Assignor to Wickwire Spencer Steel Co., New York, N. Y., a Corporation of Del. The invention relates to wire belts formed of interlaced spiral wire coils and the inventor provides a construction by which a wide belt of this type may be built up of several relatively narrow sections.

No. 1,749,939, INSULATION REMOVING PROCESS. Patented March 11, 1930 by Harley H. Heller, Riverside, Conn. Assigner to Ford Instrument Co., Inc., of Long Island City, N. Y., a Corporation of N. Y. One type of apparatus for effecting the process disclosed by this inventon consists essentially of coacting relatively moving members such as rotating rollers, discs, or a combination of discs, rollers, or stationary members set at a slight angle, between which the coated wire is passed, whereupon the coating is removed by a combined slight rolling and rubbing action from a sufficient area of the surface of the wire to provide for the proper and effective joining to other surfaces, as by soldering, brazing or any electrical process. A cutting-off member coacts with the coating removing means whereby the wire is cut off at the proper length desired.

No. 1,750,142, LINK WELDING MACHINE. Patented March 11. 1930 by Hermann Weinacker, Maplewood, N. J. Assignor to Universal Chain Co. Inc., of Maplewood, N. J., a Corporation of Rhole Island. This invention relates to improvements in chain making and link-forming machines; and has for its object to provide in such a machine means for forming a wire link first into substantially U-shape and to provide means for feeding a strip of solder wire between the open ends of the loop and then closing these loop ends onto the solder to insure sufficient solder being at the joint so that when fused the abutting ends at the joint will be securely soldered together.

No. 1,751,072, METHOD OF ASSEMBLING SPRING STRUCTURES. Patented March 18, 1930 by Gustav O. Brandt, Detroit, Mich. Assignor to L. A. Young Spring & Wire Corp. of Detroit, Mich. The method of assembling coiled body wire springs and coiled spring tie members having coils of uniform diameter into a spring cushion structure consists of positioning a coiled spring tie member in tangential juxta-position to a coil of a body spring, applying a clip adapted to embrace both the coiled spring tie member and the coil of the body spring, and closing the clip upon the parts and simultaneously offsetting the portion of the coiled spring tie member embraced by the clip providing shoulders therein at each side of the clip.

Complete descriptions and drawings of patents referred to may be had for 25 cents. Address, Wire & Wire Products, 551 Fifth Avenue, New York.

No. 1,751,094, WIRE STRAIGHTENING MACHINE. Patented March 18, 1930 by George Franklyn Matteson, Rockyhill, Conn., Assignor to The F. B. Shuster Co., of New Haven, Conn., a Corporation of Conn. The invention relates to the class of machines employed for straightening lengths of wire or similar material, and an object of this invention, among others, is the production of a machine of this kind having means to prevent rotation of the wire under forces exerted by the straightening member or arbor.

No. 1,751,381, WIRE STRETCHER. Patented March 18, 1930 by August Anderson, Shoshoni, Wyo. This invention relates to a wire stretcher, the general object of the invention being to provide means whereby any amount of slack can be taken out of a wire by alternately engaging a pair of grips with the wire and by moving a dog from one position to another and turning over the body of the device, so that the chain which carries the grips has its movement reversed.

No. 1,752,029, WIRE STRETCHER. Patented March 25, 1930 by William F. Robertson, Cincinnati, O. It is an object of this invention to provide a tightening device of this nature in which a wire winding spool or reel is normally, positively held against backward or wire loosening movement and whereby upon any slight amount of tightening, backward movement of the spool is automatically and immediately prevented.

Domestic Exports and Imports of Wire and Wire Products

Exports of iron and steel wire and wire products from the United States in December, 1929 and January, 1930
(In gross tons)

Item	February 1930	January 1930	February 1929	Year through February 1930	Year through February 1929
Wire rods	4,373	3,481	3,539	7,854	7,950
Plain wire	2,083	2,891	5,498	4,974	9,343
Barbed wide and woven wire fencing	2,884	2,414	5,642	5,298	12,171
Wire cloth and screening	144	187	201	331	353
Wire rope	568	412	724	980	1,344
Insulated wire and cable	78	44	66	122	229
Other wire and manufactures	797	888	1,189	1,685	2,115
Wire nails	532	517	1,589	1,049	3,087
Nails other than wire	535	591	671	1,125	1,507
Tacks	26	43	44	69	102
Bolt, nuts, rivets, except track	1,245	1,122	1,279	2,367	2,690

Imports

Imports of iron and steel wire and wire products into the United States
(In gross tons)

Item	February 1930	January 1930	February 1929	Year through February 1930	Year through February 1929
Wire rods	1,115	944	595	2,059	1,778
Barbed wire	695	377	349	1,072	634
Round iron and steel wire	275	447	540	722	1,142
Steel telegraph and telephone wire	1			1	
Flat wire and strip steel	100	209	167	309	316
Wire rope and strand	155	297	153	452	286
Other wire	21	55	38	76	79
Nails, tacks and staples	274	595	558	869	1,266
Bolts, nuts, rivets and washers	49	26	23	75	41

EXPORTS of iron and steel products in Feb. declined 12.3 per cent, in comparison with the shipments made during Jan. In general, however, the trade showed an upward trend—that is, when considered on the basis of the various classes of material shipped—despite the decline registered in the total trade. Further, shipments to the major market area in point of volume of sales—those to the countries of North and Central America and the West Indies—showed a good increase in the total of their purchases.

The import trade in iron and steel products turned upward in Feb. This trend was not reflected by the trade as a whole, however, as only 11 classes of material showed increases, against 15 returning losses. The largest of the first named was the gain in shapes, 3,455 tons, while other outstanding gains were those in cast-iron pipe, 1,097 tons, in steel bars, 1,061 tons, in hoops and bands, 1,023 tons.

Receipts of card clothing dropped off—Feb. receipts totaling 20,440 sq. ft., valued at $33,626. This entire quantity was received from the United Kingdom. Imports of wire cloth and screening rose to 43,731 sq. ft. —21,884 sq. ft. coming from Germany, 15,917 sq. ft. from Canada, and 5,930 sq. ft. from France.

France was again the principal source of the wire heddles imported, 2,821,000 of the total of 5,430,000 coming from that source. Other suppliers were Switzerland, 2,233,000, and Germany 376,000 pieces. Imports of wood screws totaled 10,464 gross ($1,327) — Sweden supplying 9,667 gross ($1,045) and with smaller quantities coming in from the United Kingdom, Canada, and Czechoslovakia.

Rivets of monel metal are proving corrosion-resisting properties in the fastening of hoops around soft drink barrels.

—

Hallden Machine Co., Thomaston, Conn., has been incorporated with a capital of $200,000 by Karl W. Hallden and Roger C. Jones, Thomaston, and Margaret J. Maligan, Waterbury.

WATCH THIS SPACE FOR REPORT ON NEW "RED HEAD" UNIVERSAL ALL STEEL SHIPPING REELS FOR CABLE AND WIRE

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Silver solders **flow much more freely** than base metal solders. On production work the higher speed of operation frequently saves many times the cost of the solder itself.

Small quantities of silver solder penetrate deeply, making neat, sound joints. Such joints require little or no finishing.

Silver Solders Join All Metals Fusing at 1400° F. or Above

Copper, brass, iron, steel, stainless steel, monel metal, nickel, nickel-silver, silver, extruded brass and bronze.

Relatively Low Working Temperatures

'Handy" Silver Solders flow at 1325° to 1600° F. depending upon their silver content. They can therefore be used on thin sections of metal without injury to parts.

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Manufacturing Tape-Armored Cable

(*Continued from page 159*)

upon which is wound a layer of paper tape. The cable is then passed through two or more compound tanks and jute is wound on after each coating of asphalt. Jute is a fibre from tall plants, mostly in tropical regions. The vegetable surface is removed leaving the hard inner fibre which is cured and dried then spun nito a yarn or roving. In this form it is impregnated with asphalt compound and wound into cops, which might be described as conical masses of the yarn wound on a spindle or tube. In this case the size of the cops is proportioned to the machines used in the cable-covering plant.

After the serving or covering of paper and two servings of jute, as just described, the steel tape is applied. This is soft annealed steel and varies in width and thickness with the diameter of the cable and the need for protecting against mechanical damage. Obviously a wider and thicker tape will give a stiffer and stronger armor than a thin and narrow one. It would also make the cable less flexible to handle in the process of winding at the factory, unwinding in the field, and while burying it. This steel tape is spiralled

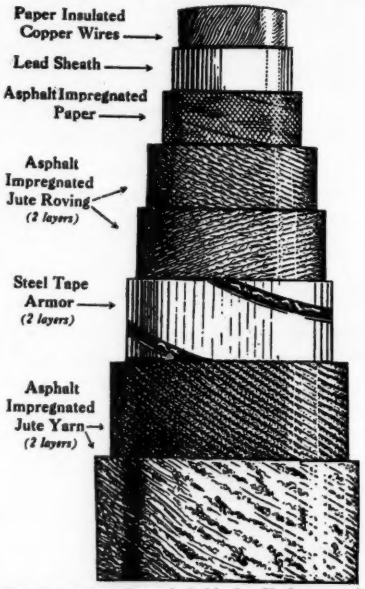
Paper Insulated Copper Wires
Lead Sheath
Asphalt Impregnated Paper
Asphalt Impregnated Jute Roving (2 layers)
Steel Tape Armor (2 layers)
Asphalt Impregnated Jute Yarn (2 layers)

Fig. 5. Section through Cable for Underground Burial, Showing Successive Coats Applied for Protection.

around the cable in two layers, the outer overlapping the spaces of the inner.

The cable is then passed through more compound tanks and receives two more servings of jute after which it is covered with an outer coating composed of whiting, water and a small amount of glue. This serves two purposes, it prevents the layers of cable on the reel from sticking together, and because of its light color lessens the rate of absorption of heat from the sun when cables are in the open.

Coatings Double Cable Diameter

In these various processes of applying the protective coatings, as just described, the diameter of the cable structure is gradually built up until the finished product is more than twice the diameter of the original lead sheath upon which they are built. It is well to remember that this encloses a group of many very much smaller copper wires which are actually used for the transmission of the feeble electric currents of telephone work.

When the armoring process as just described and as shown graphically in Fig. 5 herewith is completed on the machines some of which are shown in Figs. 1, 2, 3, 4 and 6, the cable is tested for electrical defects. As a final test to make certain that the lead sheath is sound and free from holes, an automobile tire valve is sealed into one end and the cable filled with a dry gas under 15 lbs. pressure approximately. This is allowed to stand for several hours and if the pressure has not decreased in that time, the lead sheath is acceptable and the cable is released for shipment.

This particular cable was constructed at the Western Electric plant at Kearny, N. J., for the Southwestern Bell Telephone Co., and consisted of 200 miles of the new type tape armored cable to be laid from Fort Worth to Cisco, Texas.

How Armored Cable is Shipped

The problem of shipping the heavy reels, weighing approximately 9,000 lbs. each, was solved by placing the reels side by side on a flat car and running a heavy rod through the center holes of the pair. This rod was fastened by heavy bolts to the stake holders of the car. A carload consists of 8, 10 or 12 reels, depending on the size and condition of the car.

The illustrations have been chosen so as to depict the progress of the cable through the plant in successive steps, and in practically the same order as the materials are applied to the lead sheath containing the telephone wires. In general a cable of this kind is completed in a single trip along a string of the necessary machines, coatings tanks and other units. Such a string, arranged to produce the result just described, is referred to as a machine. Besides the equipment at Kearny, shown and described, four 'machines' at the Hawthorne, Ill. plant and two at Point Breeze, Md., will prepare tape-armored cable for burial.

Copperweld Steel Co., Glassport, Pa., has completed shipment of 119 miles of copperweld overhead ground wire and a quantity of copperweld messenger strand to Manila, P. I., for use in the construction of a large hydro-electric station under construction near Manila by W. S. Barstow & Co., for Manila Electric Co.

The copperweld type of wire, combining copper and steel through the molten welding process, is being used to withstand tropical gales, which necessitate wire of high strength and other special precautions to protect transmission lines against falling trees and other danger from storms.

The Driver-Harris Co., Harrison, N. J., has been awarded a gold medal for its exhibition at the Exposition Internacional de Barcelona, Spain, 1929.

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SOLDER WALL
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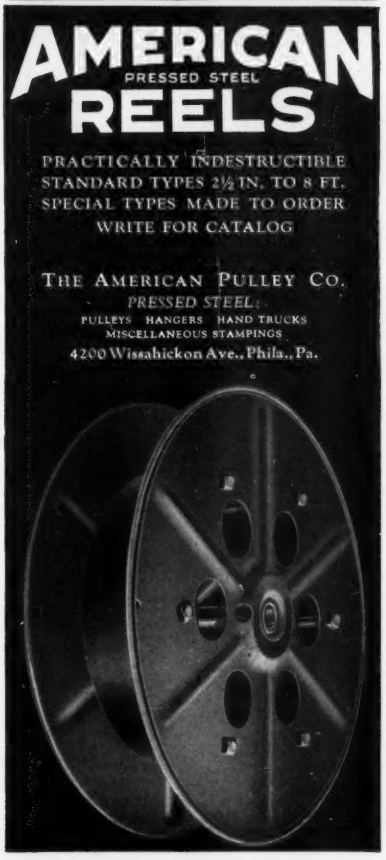
RADIO SOLDER



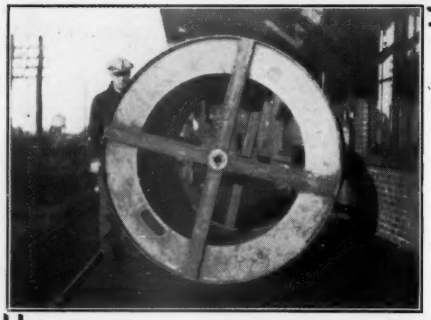
Coloring Wire Gauze

(*Continued from page 161*)

pulled between the printing rolls of the coloring machine around the running off cylinder of the stretching block or on the lower and upper running off rolls of the carrying supports. The portable stretching block is then drawn out and the band of gauze stretched so that it still sags slightly. By this means any desired number of rolls may be pinned together and hung along the stretching width between the coloring machine and the stretching block which is usually 16 m. This working length enables the coloring of rolls required for the export trade, 100 ft. in length. The greater the distance between coloring machine and stretching block (which should preferably be a multiple of 16 or 8 m) the more favorable the production is, as the fitting and removing of the material requires almost the same time when one or more rolls of 100 ft. each with an overall measurement of 100 ft. are introduced.

Floor Space Needed

In order to be able to color rationally the maximum roll length in a single piece a room allowing a spreading out 20 m. in length and 6 m. in width will suffice. The output of such a plant would be 800 to 1,000 sq. m. per working day of 8 hrs. operated by two men and with a minimum roll width of 100 cm. and this production could be increased to 2,000-2,200 sq. m. with otherwise identical conditions except that the working space is 35 × 11 m., which space, without taking in consideration the time necessary for the drying, enables a continuous clear working, whereas with the smaller plant a drying duration of 1 to 2 days must be allowed between the various colorings according to the time of the year.



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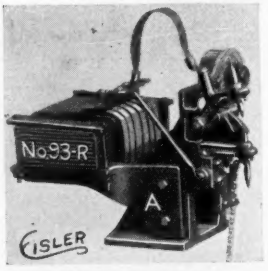

Machine No. 93-R

Eisler Electric Spot Welders are extensively employed in the manufacture of Radio Tubes, Incandescent Lamps, Jewelry, Metal Novelties, Sheet Metal Work, Wire Welding, Etc. Wire or sheet stock as fine as .0005" to 1/16" may be welded or fused together. Made in many sizes and styles.

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After this deviation we will return to the coloring machine fitted ready for starting up in which after being prepared in the manner described a gearing is thrown-in which drives the coloring and printing cylinders. The first cylinder conveys the coloring material from the color box onto the printing cylinders between which the gauze is moved towards the running off cylinder of the stretching block and at the same time covered with color.

Scraper Removes Excess Color

As soon as the gauze has passed once between the two printing cylinders the color cylinder is cut out of the gearing and a scraping device engaged which removes the superfluous color material from the printing cylinders and thereby also from the gauze passing between same. The band of gauze should run through the machine thus set, at least twice, providing that the color is of ordinary consistency as with a thin liquid color it will be necessary to repeat the scraping once or twice more.

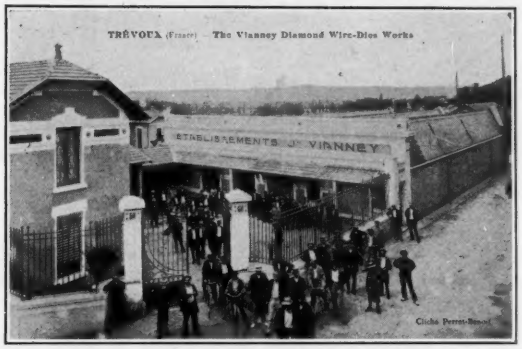
The seams of the gauze bands are disengaged by removing the wire pins and the moist gauze brought onto the drying device which is arranged on each side of the coloring poth. The drying device consists of simple wire hooks which are movably fitted in tandem by means of an eye on rails suspended transversely to the coloring path and which can thus be approached towards the coloring path on the right and on the left.

Colored Gauze Dried Vertically

By means of these hooks the gauze is brought from the horizontal into the vertical position by suspending its edge wires, and pushed against the longitudinal walls of the coloring shop. In order to ensure that the gauze will have an equal and smooth surface after the drying the longitudinal ends of the rolls are clamped in wooden or flat iron bars which are connected with pull ropes and can

VIANNEY

Famous Wire Drawing Diamond Dies



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Long wear--Smooth-Drawing--Accuracy

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Hubbard Spool Co.

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be stretched along the length walls of the working room.

The colored rolls thus hang parallel the one besides the other in the length and are removed after complete drying, rolled and made ready for despatch. The number of rails for the suspension hooks depends upon the length of the coloring path and the rails are arranged at distances of about 5 mtr. apart on the ceiling of the working room. The number of stretching rails is dependent upon the number of rolls which are to be colored in a working period.

Difficulties Center in Quality of Color

The operation according to this method is comparatively simple and one would imagine that no difficulties are to be expected which the experienced workman could not avoid. These difficulties are always due to the composition of the coloring material used. When purchasing colors specially when they are obtained ready for use not the price but the quality of material supplied for a long period by a certain supplier of repute, should be the determining factor.

Even if this rule is observed it also often happens that the supplier delivers a material of different quality which causes difficulties for all those working in the coloring department. If the color is too liquid it does not cover the wire, if the color is too viscuous the consumption is too great and the most serious is a "weighted" material, as the gauze will not take same at all but it drops off onto the ground. The color must have a suitable percentage of volatile dissolving substance (turpentine, turpentine oil substitute) so that the drying does not take up too much time. The use of the first-class linseed oil varnish is also important, which varnish once air dry must not react on heating.

Shipping Conditions Must Be Considered

Considerable quantities of colored gauze are shipped every

year as so-called "mosquito nets". It may be that the cases may be stored on board ship near the boilerhouse, besides which the material passes through zones with a high sun temperature. Both influences cause the inferior varnish to react. The subsequent drying is effected in cooler rooms in rolls, so that in most cases this explains the fact that gauze which left the works is absolutely dry condition arrives at the place of destination stuck together and useless.

Concerning the composition of the color many gauze coloring works mix their own colors ready for use. The equipment for this consists in a color grinding machine. It is therefore not very expensive and soon pays for itself, as a lowering of price is dependent on the advantage of uniform composition. It is difficult to make a golden rule concerning the receipt for the mixing of the suitable coloring paints as this is dependent upon the origin of the individual constituent parts and the proper suitability to each other as the natural conditions must be found through tedious research.

Important Forms of Coloring Material

The basic elements which must be obtained, are first-class linseed-oil varnish, color varnish, powdered paint, colloidal thinning medium, turpentine and chalk. Varnish colors are used in light green, orange yellow, steel blue, white and grey shades, whereby the former predominates. In the case of single coated Mosquito nettings about .08 kg. of color must be reckoned per sq. m., about .12 kg. for two coated netting (e. g. green priming and green top coating), which figures may be taken as a guide also for blue coloring. Yellow, white and grey colors take more and these average figures fluctuate according to the different covering capacities. Black colored iron gauzes are lacquered with an iron lacquer of medium quality. Alcohol and spirit varnishes

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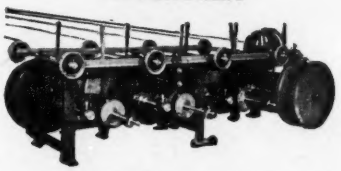

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may be used as coloring materials on the coloring machine above described. These materials owing to their high volatility guarantee an absolutely dry gauze with a higher cost of production.

Details of Automatic Coloring Process

Another method of coloring gauze which up to the fitting of raw gauze and the carrying off of the colored material, works entirely automatically, has been brought out by the Jäger Engineering Works of Neustadt a. d. O. about 2 years ago. It relates to a combination of the coloring machine already described in principle and a drying enamelling furnace. The plant enables the cloth to be produced in absolutely dry condition, ready rolled and ready for despatch, without depending upon the time occupied for drying as also the size of the working room, and the production increases. This process delivers a product which is not only equal to the American standard article but is even superior; whereby it may also here he briefly mentioned that the Americans have for years conveyed the moist gauze through drying towers which are maintained at a suitable temperature by steam or hot air. The drying furnace of the Jäger Works represents the most perfect process for gauze coloring. Finally, another coloring method is worthy of mention which up to the present is only in the experimental stage. This is a utilisation of the paint spraying apparatus which has been introduced everywhere and have proven very satisfactory. The utilisation of this apparatus for economically coloring iron gauze is probably still very remote and will become acute only when the enormously high prices of the nitro-cellulose varnishes used therefor are reduced so that they can be used for the colored gauze, the present-day price of which is cut very low. This method will be perfect and overcome even the slightest objection to which the above described processes are open.

Hard-Metal Dies

(*Continued from page 163*)

4th—The machine used.
5th—The speed of drawing.
6th—Full information regarding the casing desired.
7th—And lastly, but of the utmost importance, the maximum size to which it is desired to open up the die.

When trying out these new tungsten carbide dies they should be tried under favorable conditions. Quite frequently a chilled iron die is removed from the line, and replaced by a tungsten carbide die. The wire cups and breaks, and the die is blamed. In a paper presented at the New York meeting of the Amer. Inst. Mining & Metallurgical Engineers (Technical Pub. 285, Class E. Inst. of Metals, No. 97)* the reason for this cupping is made very evident. The author states that if a continuous wire machine is drafted too tightly cup and cone wire will be produced. If the machine is drafted in such a way that one carrier does not deliver metal to a die as rapidly as the next carrier can remove it, which causes tension in the wire, the condition is not balanced accurately, and the wire

*By H. C. Jennison of Waterbury, Connecticut.

The Waterbury Wire Die Co.

Diamond, Composition and CHILLED IRON DIES

Waterbury, Conn.

breaks. Chilled iron dies wear rapidly, and there is not much tendency to develop a tightly drafted machine. Tungsten carbide dies wear very slowly, and when such a die is used in connection with chilled iron dies an unbalanced condition results. For a fair trial the line should be entirely tungsten carbide dies.

Some Production Records

From a plant drawing copper wire the following report is obtained: "The original wire is $\frac{5}{16}$ in. in diameter. In four passes they reduce it to .176 in. From there they reduce it in two passes to .148 in. These dies so far have drawn 237,480 lbs. of wire. They have lost .002 in. and they still have .002 in. to go." This means—according to the man in charge— that they will draw with these dies over one-half million pounds of copper wire. This drawing operation is done at 800 ft. per minute.

In another plant these dies were furnished for sizes .102 down to .036 in. These dies were put to work drawing copper wire which had never been successfully drawn through any tungsten carbide dies they had tried. The dies were put to work on Dec. 20 and on Jan. 21 were still drawing wire in the original size.

Another mill had the following specifications on the drawing operation: Draft .343 to .310 in.; composition of steel—low carbon, open hearth; hot rolled wire, pickled in lime and drawn cold. Two .310 in Carboloy dies have drawn over one million (1,000,000) lbs. of steel rod and are over size only one and one-half thousandths (.0015 in.)

One mill reports that the finish obtained drawing soft process basic wire through a Carboloy die was so superior to product obtained through other dies that a customer refused to accept order unless he could be assured of the superior finish. A .224 in. die drew 21 tons of this wire and is still on size. The die paid for itself on this order alone.

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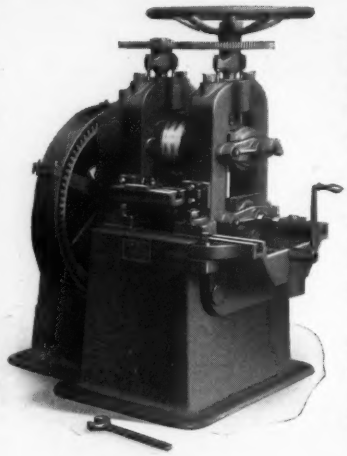
General Offices and Mills
Glassport, Penna.

Lime for Wire Drawing

(*Continued from page 167*)

The shaft type of kiln consists, roughly, of a vertical metal cylinder, lined with refractories, into which limestone is introduced at the top, there encountering a counterflow of heat on its downward passage, the heat, of course, being produced by fuel introduced through various fireing devices penetrating the shell of the kiln and which are located short distances above the bottom. The downward travel of the stone is of necessity very slow for it is impossible to speed such travel faster than lime is drawn off through what is termed the cooler at the bottom. Usually lime is drawn off every six or eight hours so that the process is virtually a batch affair instead of a continuous process.

The above description of shaft kiln operations is very crude, but is merely intended to convey the fact that such an operation must, of necessity, require large pieces of limestone, (4-10 in.), in order to furnish sufficient voids to allow a draft through the kiln. Large pieces of stone require extreme high temperature and as has already been noted from six to eight hours are necessary to calcine one batch. The time element, therefore, is considerable.



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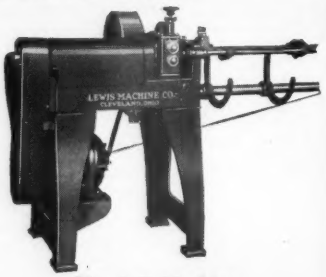

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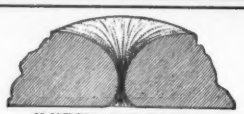

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Influence on Abrasive Formations

It is to be noted that large lumps are over-calcined on their exteriors and small lumps all the way through. Aside from this there are certain defects in shaft kiln operations which at times extend the batch-burning to twice its normal time period, and all of this only intensifies the formation of abrasive silicates already referred to. It is true that a selection can be made of the finished product, but this cannot be expected to be exceptionally efficient.

Distinct from the shaft kiln as a lime-burning unit is the modern rotary kiln. This consists of a long metallic cylinder, slightly inclined, mounted on trunnions, and lined with refractories in much the same way as are cement kilns. Some of the largest rotary kilns are 175 ft. long and 9 ft. in diameter. Limestone is crushed to 1½-in. size and under, classified to different sizes, and then uniformly fed into the upper end of this kiln. A slow revolution of the kiln on its trunnions gradually moves the classified stone within it down the inclined length of the kiln where it encounters a

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counter current of flame. That flame, as in shaft kiln operation, can be produced from either gas, oil, or coal; but if coal is the fuel, it of course must be powdered.

Of the three types of fuel, gas appears to be the more nearly ideal fuel. The flame from it simulates more nearly the flame of the old wood-burned product. Oil and coal generally produce intense flames, and, of course, in the latter there is danger of contamination.

It is obvious that burning in a rotary kiln is a continuous process which lends itself to chemical and mechanical control and also to heat regulations. The limestone is reduced to size that permits complete, yet moderate burning. (Recent tests conducted on the gas fired rotary kiln of the American Lime & Stone Co., at Bellefonte, Pa., showed that complete calcination took place in slightly less than one hour. This is a considerable reduction in time from the normal 6-8 hour period for shaft kilns.) It is quite evident, therefore, that this modern method of lime-production in gas-fired rotary kiln is the logical method, permitting a duplication of the good qualities noted in wood-burned lime which have made it so valuable in wire drawing as well as in various chemical industries.

Rotary Type Permits Mass Production

The rotary kiln is the means by which the modern lime manufacturers maintain mass production, and mass production is necessary to keep abreast of the present trends toward economical production in other lines of industry. Fortunately, the lime manufacturer is able to do this and still improve the quality of his product.

It must be borne in mind that all the above pertains to high calcium lime, and also that the study of a high calcium wood-burned lime shows that it is a material which slakes very readily in water, yielding a large

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Listing in the Professional Directory is recommended to all engineers, engineering and construction firms and consultants seeking business with wire mills or plants utilizing wire in any form.

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mass of smooth creamy lime putty. Usually this yield is approximately threefold in bulk. Large yield of putty mean large yields of mils of lime for wire drawing.

Hardburned limes are slow in slaking, yielding as low as two fold in putty with the accompanying low yield of milk of lime. It seems that quick slaking and high yields go hand in hand, and it is a striking analogy to note that a rotary kiln high calcium lime when produced under proper supervision from a superior quality limestone makes an unsurpassable quick slaking product. Indeed, in some instances this quick slaking re-action is so intense that it is impossible to materially retard its action even with an excess of cold water. This is the type of high calcium lime which yields a maximum quantity of milk to give a smooth even coating as a lubricant for wire drawing and the die stamping of sheets. It is the type of lime that gives the maximum suspension in the milk of lime.

Rotary kiln lime lends itself to selection and in addition to this and the other factors already enumerated, if the lime manufacturing takes the precaution of pulverizing an extra selected product to a fineness so that it will all pass the 100 mesh standard testing sieve, the final trace of anything deleterious to wire drawing will be eliminated.

British Developments in 1929

(*Continued from page 160*)

plications of the metal, however, and of its alloys continue to grow both in number and extent. Steel-cored aluminum conductors are being used for the 132,000-volt lines of the British national power scheme, and also for the vast number of secondary distribution lines. Where small conductors are required an aluminum-silicon alloy, having a conductivity within 5 per cent of that of pure aluminum, provides twice its tensile strength.

BUYERS' GUIDE

For more complete information, consult the annual Directory, Index & Buyers' Guide.

ANNEALING SALTS
European Color & Chemical Co., Weehawken, N. J.

ANNEALING POTS
Columbiana Boiler Co., Columbiana, O.

BAKERS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CLEANING COMPOUNDS
Oakite Products, Inc., N. Y.

CRANES
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIAMONDS—Industrial
Abr. Levine, New York

DIES—Chilled Iron
Waterbury Wire Die Co., Waterbury, Ct.

DIES—Diamond
Atlas Wire Die, Co., New York, N. Y.
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Bellet Diamond Die Works, N .Y.
Cochaud Wire Die Co., New York.
Driver-Harris Co., Harrison, N. J.
Globe Diamond Die Corp., New York
Koebel Wagner Diamond Corp., Newark, N. J.
F. Krause & Co., Inc., Jersey City, N. J.
Master Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Urdika Wire Die Co., N. Y. C.
Vianney Wire Die Works, New York.
Waterbury Wire Die Co., Waterbury, Ct.

The National-Harris Wire Co. has absorbed the Standard Alloy Wire Co., Newark. National-Harris Corp., a Delaware corp., capitalized at $2,000,000 has taken over the assets of the N. J. concern, the capitalization of which has been $500,000. Officers of the organization will continue as at present. Frank R. Harris, President. J. Frank Kavanaugh, head of the Standard Co., and an expert in the production of resistance and enameled wires will join the directorate. He was master mechanic before he organized the Standard Co., in 1926.

The Eisler Electric Corp., and its predecessor company report for last year net profits of $1,046,231 after depreciation, Federal taxes and other charges, equivalent to $5.23 a share on 200,000 common shares, against $200,498, or $1 a share, in the preceding year.

The Harshaw Chemical Co., Cleveland, has removed its executive and sales offices to 1945 East 97th Street, that city.

The General Cable Corp. and subsidiaries report for 1929 a net income of $4,709,160 after depreciation, interest, Federal taxes and inventory reserve, equivalent, after dividend requirements on preferred and Class A stocks, to $4.20 a share on 484,860 no par common shares, against $3,887,803, or $2.90 a share on 457,500 common shares in the preceding year.

Revere Copper & Brass, Inc., formerly Republic Brass Corp. reports for 1929 net income of $3,379,679 after interest, depreciation, Federal taxes and appropriation of $820,000 for inventory reserves, equivalent after requirements on preferred and Class A stock to $3.31 a share on 509,247 no-par common shares, against $3,834,570, or $4.20 a share, in 1928.

Nichols Wire, Sheet & Hardware Co., Davenport, Iowa, is planning to rebuild part of local wire manufacturing plant recently destroyed by fire. Headquarters are at Twenty-first and Main St., Kansas City, Mo.

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Acme Wire Company reports for year ended Dec. 31, 1929, net profit of $453,564 after charges; this compares with $203,679 in 1928.

Broderick & Bascom Rope Co., St. Louis, maker of wire rope and cables, has moved its offices from 801 North First Street to its new administration building, 4203 N. Union Blvd.

Westinghouse Electric & Mfg. Co., 2209 Ashland Road, Cleveland, contemplates a two-story galvanizing unit to local works, to cost over $60,000 with equipment.

Statement of ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of Wire & Wire Products published monthly at Washington, N. J., for April 1, 1930.

State of New York, County of New York, ss.: Before me, a Notary Public in and for the State and county aforesaid, personally appeared Richard E. Brown, who, having been duly sworn according to law, deposes and says that he is the Publisher of Wire & Wire Products and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Quinn-Brown Publishing Corporation, 551 Fifth Avenue, N. Y. City; editor, Morris A. Hall, 551 Fifth Avenue, N. Y. City; managing editor, none; business manager, Richard E. Brown, 551 Fifth Avenue, N. Y. City.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Quinn-Brown Publishing Corporation, 551 Fifth Avenue, New York City. George I. Baker, Hammonton, N. J., Leta B. Brown, 551 Fifth Avenue, New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding one per cent of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

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RICHARD E. BROWN,
(Signature of Publisher)

Sworn to and subscribed before me this 26th day of March, 1930.

(SEAL) ROSE MARCUS,
Notary Public.

My commission expires March 30, 1931.

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Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Bellet Diamond Die Works, N. Y.
Cochaud Wire Die Corp., New York.
F. Krause & Co., Inc., Jersey City, N. J.
Urdika Wire Die Co., N. Y. C.
Vianney Wire Die Wks., N. Y.

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Carboloy Co. Inc., New York, N. Y.
Master Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.

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Kester Solder Co., Chicago, Ill.

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Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

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Amer. Lime & Stone Co., Bellefonte, Pa.

LUBRICANTS—Wire Drawing
R. H. Miller & Co., Homer, N. Y.
J. T. Robertson Co., Syracuse, N. Y.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.

MACHINERY—Bundling
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson.

MACHINERY—Cable
Watson Machine Company, Paterson, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Cutting
American Insulating Mach'y Co., Phila., Pa.
Eisler Electric Corp., Newark, N. J.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., Cleveland, O.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Coiling
Broden Const. Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.
M. D. Kilmer & Co., Cleveland, Ohio.

MACHINERY—Galvanized Wire
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Insulating
American Insulating Machinery Co., Phila.
New England Butt Co., Providence, R. I.

MACHINERY—Measuring Wire
New England Butt. Co., Providence, R. I.
Watson Machine Company, Paterson, N. J.

MACHINERY—Nail
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Panning
American Insulating Machinery Co., Phila.

MACHINERY—Magnet Wire Enameling
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Pointing
Torrington Mfg. Co., Torrington, Conn.
Morgan Construction Co., Worcester, Mass.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
The Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rivet
The Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

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BUYERS' GUIDE, Continued

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Spooling
Torrington Mfg. Co., Torrington, Conn.
American Insulating Machinery Co., Phila.
The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Eisler Electric Corp., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., Cleveland, O.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
American Insulating Mach'y Co., Phila Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Swaging
Sleeper & Hartley, Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrell Foundry Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt. Co., Providence, R. I.
Watson Machine Company, Paterson, N. J.

MACHINERY—Testing
Riehle Bros. Philadelphia, Pa.
Henry L. Scott Co., Providence, R. I.

MACHINERY—Trolley Wire
The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Welding
Eisler Electric Corp., Newark, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
The Torrington Manufacturing Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt. Co., Providence, R. I.
Watson Machine Company, Paterson, N. J.

NEUTRALIZING COMPOUNDS
Oakite Products, Inc., N. Y.

PATENTS
Lancaster, Allwine & Rommel, Washington, D. C.

POTS—Annealing
Columbiana Boiler Co., Columbiana, O.

REELS—Annealing
American Pulley Co., Philadelphia, Pa.
Apco-Mossberg Co., Attleboro, Mass.
R. B. Hayward Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.
J. T. Robertson Co., Syracuse, N. Y.

SOLDER
Kester Solder Co., Chicago, Ill.

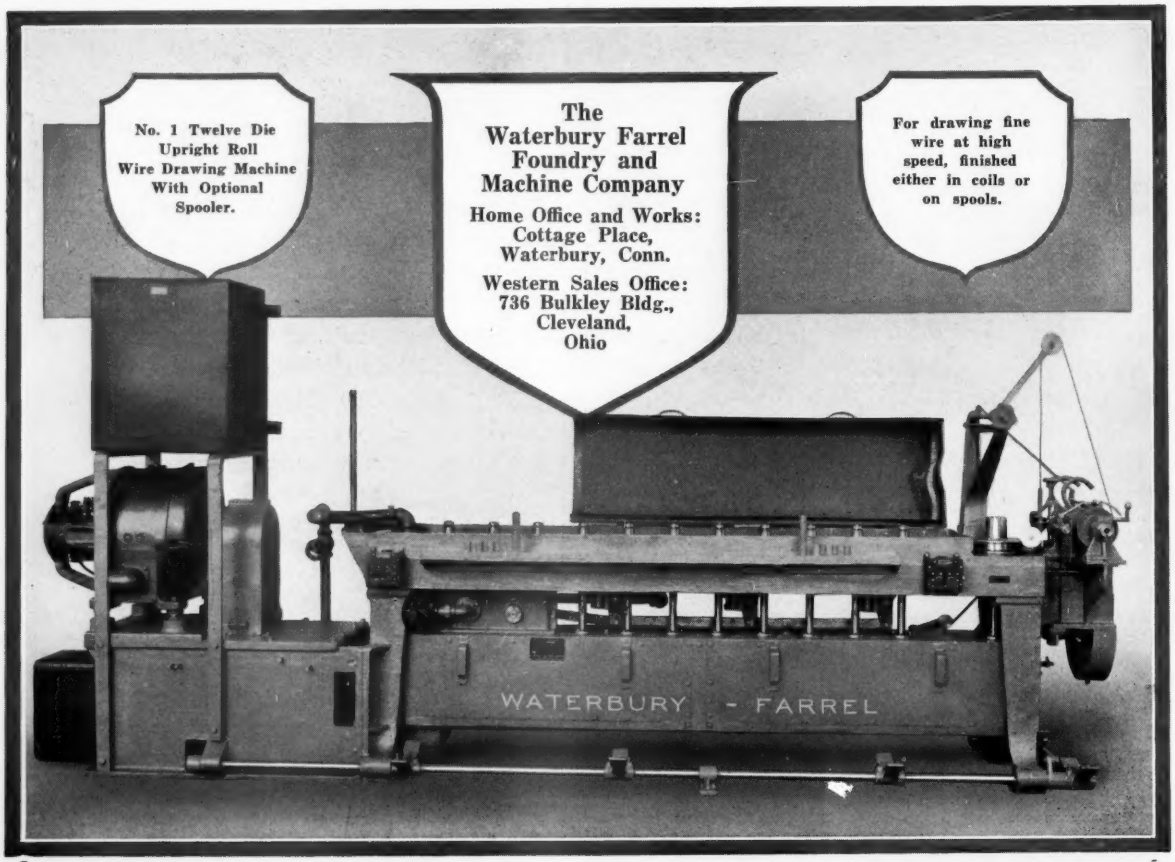
SOLDER—Silver
Handy & Harman, N. Y.

SPOOLS—Wire & Cable
American Pulley Co., Philadelphia, Pa.
Apco-Mossberg Co., Attleboro, Mass.
R. B. Hayward Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

WIRE—Various Kinds
Hudson Wire Co., Ossining, N. Y.
Copperweld Steel Co., Glassport, Pa.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.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Western Sales Office: 736 Bulkley Bldg., Cleveland, Ohio
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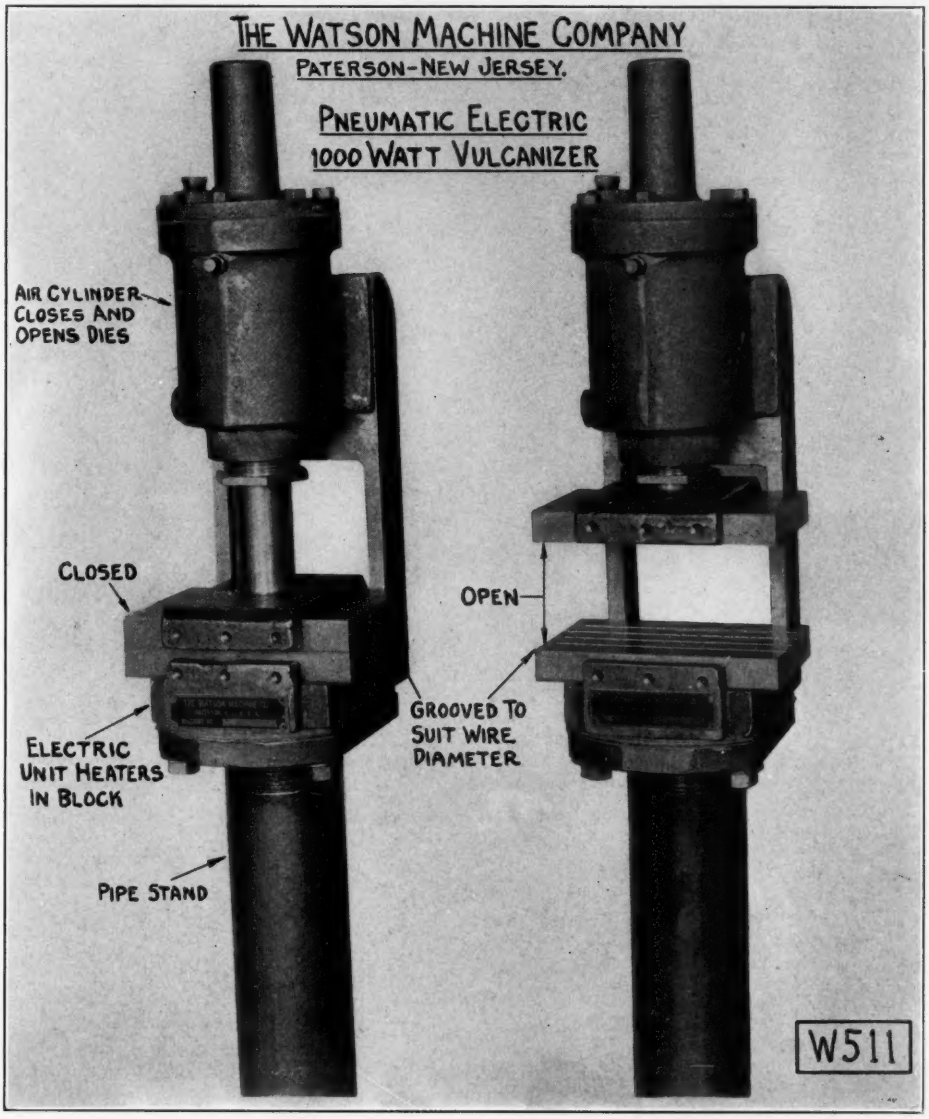
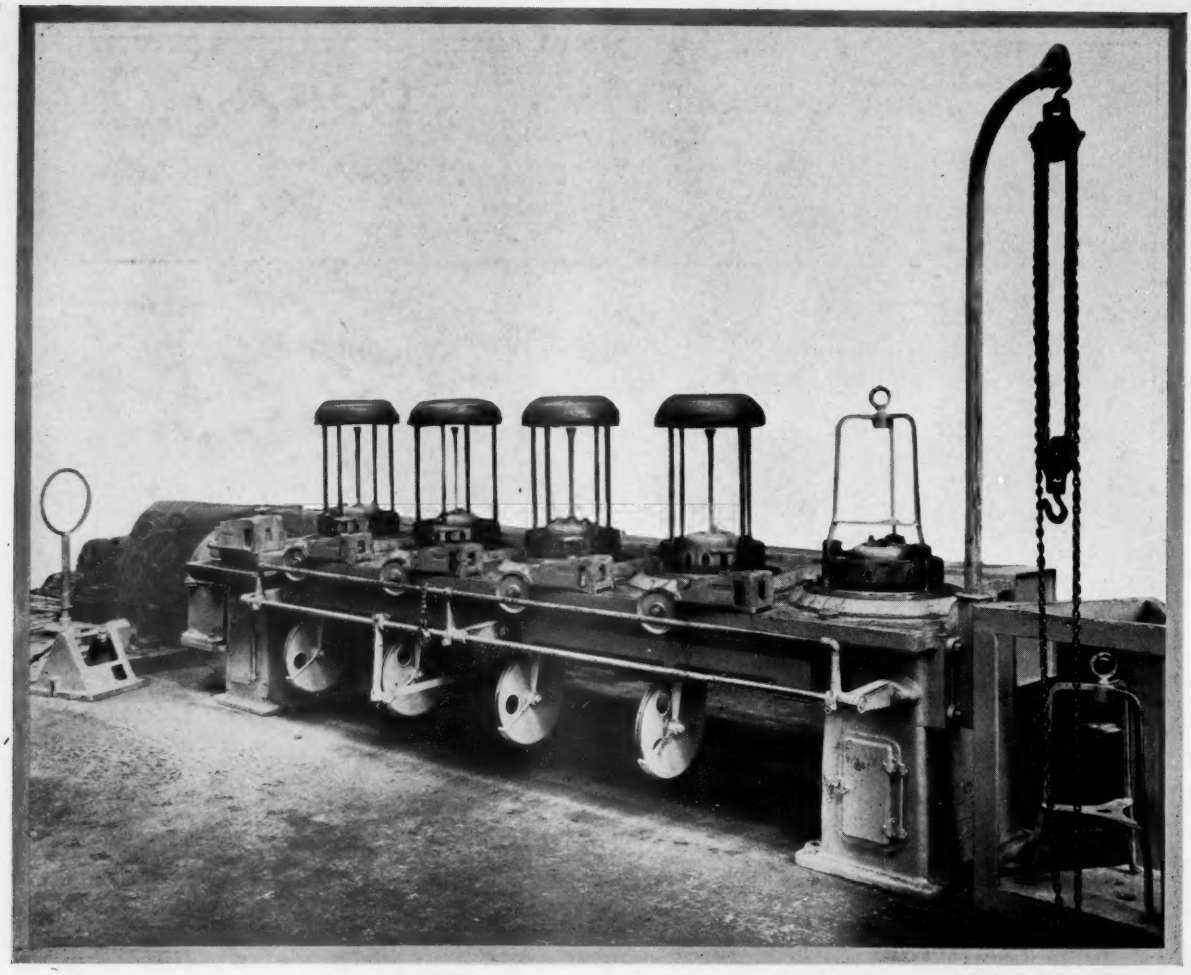


FOR WORK ON THREE QUARTERS INCH OR SMALLER DIAMETERS

ELECTRICAL WIRE AND CABLE
WIRE ROPE and CORDAGE MACHINERY



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